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## Original Articles

### ELECTROCARDIOGRAPHIC CHANGES IN EPIDEMIC DROPSY

By R. N. CHOPRA, C.I.E., M.A., M.D. (Cantab.),  
M.R.C.P. (Lond.)

BREVET-COLONEL, I.M.S.

Honorary Physician to H. M. The King

R. N. CHAUDHURI, M.B.

and

N. DE, M.B.

(From the Department of Pharmacology, School of  
Tropical Medicine, Calcutta)

THE condition of the heart in epidemic dropsy has received considerable attention from clinicians during the last decade. A perusal of the large amount of literature which has accumulated on the subject shows that the studies were chiefly limited to investigations of the subjective and objective manifestations in the patient. Little attention has so far been paid to a systematic investigation of the electrocardiographic changes. As it has been definitely shown that electrical changes in the heart give early and reliable evidence of cardiac damage, electrocardiography, as a routine investigation in all cases of epidemic dropsy admitted to the Carmichael Hospital for Tropical Diseases, was instituted. The following observations are based on a study of the electrocardiograms of 50 such cases. Patients who gave a history of previous cardiac disease or who showed old-standing organic lesions were excluded from this group.

#### Analysis of cases

*I. Rate of the heart.*—There was some degree of tachycardia in about 90 per cent of cases. A slight degree of tachycardia (heart rate between 81 and 99) was observed in 15 cases, moderate tachycardia (rate between 100 and 115) in 21 cases and severe tachycardia (rate of 120 or more) in nine cases. The highest rate of heart beat recorded in this series was 136 per minute. In only five patients was the pulse rate 80 or below.

*II. Rhythm.*—The rhythm was practically regular in 42 cases. A moderate degree of sinus irregularity was observed in five patients. In this condition the rhythm varied in regular cycles and each cycle showed a progressive lengthening of the interval between beats followed by a progressive shortening. The P—R interval remained constant while the T—P interval showed variation in length. In two patients the regular rhythm was interrupted by the occurrence of extra systoles, auricular in one case, and nodal in the other. In one patient, auricular fibrillation with a moderate degree of tachycardia was observed.

*III. P wave (the auricular deflection).*—The normal characters of the P wave are as follows :—

Height in largest lead—1 to 2 mm.; direction in leads I and II—upward; direction in lead III—upward, diphasic or downward; form—rounded, may be notched; duration—not more than 0.1 second. In the records where one lead is biphasic or iso-electric and the amplitude in other leads about equal, the normal values for P vary from 0.9 mm. to 1.8 mm.

In the present series of patients, the height of the P wave was within normal limits in 38 cases. In three patients it was below normal, indicating a poor functional condition of the auricular muscle or a poor state of nutrition; in eight patients the voltage was above normal, indicating a hypertrophy or an overactivity of the auricles. The direction of the P wave was upright in the first two leads in all cases except in the case where there was auricular fibrillation. The P wave, in the third lead, was iso-electric in three cases and inverted in three cases. The duration of P was within normal limits in 49 out of 50 cases, the remaining one being a case of auricular fibrillation. In four cases, a notching of the P wave was noticeable. This is probably not to be considered pathological as, according to Pardee (1933), notching may be a normal variation of the P wave. The opinion of Pardee on this point may be cited in this connection : 'The normal P is composed of overlapping of two electrical effects, one of which is due to each auricle. In the majority they fall so close to each other that no notching occurs. Occasionally the path of contraction in one auricle from the sino-auricular node to the tip of the apex or the base of the auricle may be larger than usual, so that the potential on that side will be slightly delayed in reaching its height. Thus, the peaks of the two electrical effects might not coincide closely, and a notching of P results'.

*IV. P—R interval (auriculo-ventricular conduction time).*—The normal limits of this interval are from 0.12 second to 0.2 second.

In 29 patients, the P—R interval was within normal limits. In 20 patients, it was found to be 0.10 second, i.e., below normal. In the remaining case, the P—R interval was 0.12 second in the first record but was changed to 0.10 second in the second record. The change in rate was but slight, 125 to 130 per minute in this case, and there was evidence of a nodal extra-systole.

*V. Q R S waves (initial ventricular deflection).*—A summary of the limits of normal Q R S is given below :—

Height in the largest lead—7 to 17 mm.; direction in leads I, II and III—chiefly upward (R), either Q or S may be present singly, but neither as large as R; form—one, two or three sharply pointed peaks or vibratory groups;

duration—not more than 0.1 second. If the record in one lead is diphasic, the amplitude in the other two leads is about equal; normal values of the height of Q R S may vary from 6 mm. to 15 mm.

Judged by the above standards, the height of Q R S, in the leads showing the maximum excursion, was normal in 32 cases. It was less than normal in two cases, one of which was a case of auricular fibrillation. This low voltage (associated in these two cases with a maximum voltage of T less than normal) indicates a weak physiological activity of the ventricles. In 15 cases the height of Q R S was above normal limits. This, in the absence of bundle branch block or abnormal degree of notching, would signify a physiological hyperactivity of muscle. In one case, the voltage was normal in the first tracing and was higher than normal in the second taken after a few days of treatment.

The direction of Q R S in the different leads was normal in 42 cases. In three cases, there was right ventricular preponderance, as indicated by the initial ventricular complex being directed chiefly downward in lead I and upward in lead III.

*VI. S—T segment.*—This was normal (iso-electric or very slightly above or below the iso-electric line) in 48 cases. Coronary T wave was seen in two cases. The characteristic feature of coronary T wave, according to Pardee, is an upward convexity of the S—T segment which carries the record at first slightly above the point of origin and then downward to form an inverted T wave. It indicates a localized myocardial degenerative process which is no longer in an acute stage.

*VII. T wave (the terminal ventricular deflection).*—The characteristics of the normal T wave are :—

Height in the largest lead—1.5 to 5 mm.; direction in leads I and II—upward; direction in lead III—upward, biphasic or downward; form—peaked. In those electrocardiograms where one lead is biphasic or iso-electric the height of T in the lead where it shows maximum excursion varies from 1.3 mm. to 4.5 mm.

The height of T was found to be within normal limits in 38 cases, and in 12 cases it was below normal. This may be due to (i) poor state of myocardial nutrition, (ii) decreased strength of ventricular contraction, or (iii) diffuse disease of the myocardium.

The direction of the T wave was upward in all leads in 21 cases.  $T_1$  was iso-electric in one case and biphasic in one case.  $T_2$  and  $T_3$  were inverted in one case;  $T_2$  and  $T_3$  were iso-electric in one case;  $T_2$  iso-electric with  $T_3$  inverted in one case;  $T_2$  biphasic with  $T_3$  inverted in one case and  $T_2$  biphasic in one case. Associated with upright T in the other two leads inversion of  $T_3$  was present in 13 cases, a biphasic  $T_3$  in one case and an iso-electric  $T_3$  in seven cases.

In one patient,  $T_3$  was biphasic in the first tracing but inverted in the later records.

The form of the T wave was normal in all the cases in which it was upright.

*Discussion.*—From an analysis of the data at our disposal, we are forced to the conclusion that a functional derangement of the heart is the most common feature in epidemic dropsy. Tachycardia of a moderate degree is common and is usually associated with a shortening of the T—P interval. An interesting finding, present in nearly 40 per cent of the cases, is an abnormally short P—R interval (0.1 second only). This abnormally short P—R interval does not seem to be dependent on the rate of the heart, as it has been found associated with a heart rate of 70 as well as with a heart rate of 136. An abnormally short P—R interval is generally considered characteristic of nodal rhythm (nodal rhythm type I of Cowan and Ritchie, 1935) with a slow rate or nodal tachycardia with a rapid heart rate. Electrocardiographic changes of this type are typical of nodal rhythm but there are a few points which have to be considered before a final opinion can be offered. The P wave is usually found to be inverted in nodal rhythm; in the cases under consideration, the P wave is upright in the first two leads. In three out of the 20 cases with an abnormally short P—R interval, there was definite sinus arrhythmia. Sinus arrhythmia is very seldom associated with nodal rhythm. This fact, taken in conjunction with the contour and direction of the P wave, makes it difficult for us to conclude that the cases are genuine cases of nodal rhythm. The P wave is probably originating from the S—A node. One school of cardiologists thinks that a P wave, which is upright in the first two leads and precedes the Q R S complex, has its origin at the A—V node. As this is a debatable point, we will leave it as an open question.

It will thus be seen that epidemic dropsy produces sinus tachycardia. The rhythm has been found to be generally regular. The occurrence of extra-systoles (auricular in one, and nodal in another) supports the supposition that in epidemic dropsy there is increased excitability of parts of the heart other than the sino-auricular node. As regards auricular activity, this is found to be normal in most cases (38 out of 50). In three cases (6 per cent) the height of the P wave is above normal limits, indicating an increase in the muscular activity of the auricles, and in three cases a subnormal height of P indicates depressed activity. It is probable that, in the case where this height of P is above normal limits, there is an enlargement (dilatation with hypertrophy) of the auricles.

Ventricular activity as judged from the height and contour of Q R S is normal in 32 out of 50 cases. But in 15 cases (30 per cent) the higher voltage points to an increase in the

irritability of the muscle. Enlargement of the heart is frequently seen in epidemic dropsy, as has been already pointed out by Chopra and Basu (1930).

That organic changes, most probably of the nature of degeneration, may be produced in the heart by epidemic dropsy, is seen from the occurrence of auricular fibrillation in one case and the 'coronary T wave' in two cases. Abnormalities of the T wave, especially in the leads I and II and in the voltage of largest T, are suggestive of myocardial damage due possibly to accumulation of fluid between the individual fibres.

In 12 cases the height of the largest T wave was found to be abnormally small. In two cases this low voltage of T was associated with Q R S of abnormally low voltage, indicating a weak functional activity of the ventricles. Of the remaining 10 cases, one was associated with Q R S of abnormal height and the rest were associated with Q R S of normal height. Roughly speaking, the voltage of T is normally about 1/5 to 1/4 that of R, and ranges from 0.2 to 0.5 millivolt. In all the leads the T wave follows the amplitude changes of R. When these relations do not obtain, a suspicion of myocardial derangement exists. This change is not severe enough to incapacitate the patient seriously but it is rare to find a small T wave with large Q R S excursion from a heart with normal reserve power.

#### Summary

(1) A critical study of electrocardiograms taken in a series of 50 inpatients of the Carmichael Hospital for Tropical Diseases suffering from epidemic dropsy is reported.

(2) In epidemic dropsy, functional disorder of the heart is very common. Sinus tachycardia and sinus arrhythmia are frequently met with. Extra-systoles sometimes occur.

(3) The P—R interval is found abnormally short in a fair proportion of cases.

(4) There is evidence of increased auricular activity in a very small proportion of the cases, which probably indicates enlargement of the auricles.

(5) The occurrence of auricular fibrillation, coronary T wave and other abnormalities of the T wave are suggestive of myocardial damage, probably degeneration.

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## CLINICAL STUDY OF SIXTY-THREE CASES OF ORIENTAL SORE

By J. GOODALL

CAPTAIN, I.M.S.

Chittagong

OWING to the earthquake which took place in Quetta on 30th May, 1935, it was found necessary to send two companies of K. G. O. (Bengal) Sappers and Miners to the scene of the catastrophe. These men were employed in work of salvage, and removal of dead and wounded. There were about five hundred and fifty men, and three or four officers, all of whom were physically fit at the time of arrival in the area. The vast majority of these men set off from Roorkee, in the United Provinces, on 1st June, 1935, and returned in November of the same year. They were a mixed collection of men, some Sikhs, some Hindus and some Mohammedans, with a few European sergeants and officers.

They provided the writer, after their return, with an excellent opportunity of studying the course, treatment, and general clinical picture of oriental sore. Approximately 11.8 per cent of them including one European sergeant and one officer developed sores in Quetta or at varying periods afterwards, on arrival back in Roorkee. Their average age was twenty-six years. Practically all the men said that the flies had been numerous and they had been bitten badly on their faces, arms, and legs. The more educated remarked that 'the ones which bit were sandflies'.

#### Symptoms

The sores appeared first as small red papules which gradually increased in size and finally, after a varying period of months, turned bluish in colour, softened in the centre, broke down and ulcerated. There was no associated pain, and no itchiness. In the case of the Indian troops, the majority of these sores became secondarily infected. They thought nothing of rubbing grass, leaves, or cowdung into their sores as soon as they were out of hospital. When this occurred the sores became painful, the surrounding tissues much swollen and pus formed.

The number of sores on one man varied from one to seventeen, but single sores were uncommon and a typical case usually presented not less than three nor more than eight.

#### Laboratory examinations

Every case of suspected oriental sore was examined for *Leishmania tropica*. In the sixty-three cases treated thirty-six showed Leishman-Donovan bodies. These bodies were not always identical in shape; there was the round or oval thick type to which the majority belonged, and the flattened type, the ends of which were almost pointed. They were very numerous in

the large endothelial cells. In spite of careful study, no bodies were ever seen in peripheral blood films.

The specimens were obtained by undermining the margins of the sores with either an ordinary hypodermic needle, or a fine glass pipette, the point being directed towards the healthy tissue. It was very unusual to obtain positive results from tissue which was heavily secondarily infected. The most satisfactory from this point of view were the small early sores before they had broken down. As a rule these were literally swarming with leishmania. Leishman's stain was commonly used, but Giemsa's was also employed and found very satisfactory.

**Blood.**—This was fully examined in about fifteen cases. The red corpuscles were present in normal numbers and showed no abnormality. The hæmoglobin was normal.

The white corpuscles showed a constant slight increase, eight to eleven thousand per c.mm.

The differential counts revealed in every case an eosinophilia, of from four to fourteen per cent. There was an increase in the number of small lymphocytes on an average of 6 per cent. The large lymphocytes and monocytes, counted together, on an average were 8 per cent above the normal, a typical count being as follows :—

Polymorphonuclears (neutrophil) ..	50
Small lymphocytes ..	23
Large lymphocytes and monocytes ..	17
Polymorphonuclears (eosinophil) ..	10

The aldehyde test was carried out on six cases with a negative result.

Wassermann reaction carried out on two very chronic cases was negative.

### Treatment

As numbers of cases of oriental sore began to appear at the Indian Military Hospital, Roorkee, for treatment, and as the sores did not improve at once, records of the different drugs used were kept for comparison. The number of patients soon became so large that special days and times had to be allotted for their attendance and careful notes kept of each case. It must be made clear, however, that no startling results nor rapid cures have been obtained. The following records of treatment are offered as showing the effects of the different drugs, antimony, emetine and orisol, on patients of the same type, and infected under the same conditions. It is, in other words, a fair test of the respective merits of these drugs.

Neostibosan was also used but only in one case, for reasons of economy.

The treatment consisted of two distinct kinds :—

(a) Specific treatment and (b) local treatment, the two always being administered in conjunction with each other. At first potassium antimony tartrate alone was used. Later,

emetine, orisol and finally neostibosan were tried. Reference was made to the reports of Varmā (1927) and Dās Gupta (1930) and the original technique was altered slightly to comply with their methods. This made no material difference to the results obtained.

### Local treatment

The majority of cases were treated with dressings of gauze soaked in normal saline, the wound having been previously cleaned with spirit. Finally, a bandage was applied. This dressing was changed twice a day, outdoor patients attending in the morning and evening. Septic cases were sometimes fomented with magnesium sulphate or boric acid. At times the dressings were soaked in hypertonic saline but this made no appreciable difference. Iodine was painted over the healing areas in several cases and was found very successful, but this was only used when definite signs of healing had been seen.

### Specific treatment

**Potassium antimony tartrate.**—This was used in varying strengths which can be seen on reference to the table. For a soldier of average weight and in good health, apart from the sores, the most effective dosage was as follows: A preliminary dose of gr.  $\frac{1}{2}$  potassium antimony tartrate in 5 c.cm. sterile freshly-prepared distilled water was given intravenously, and this was followed three days later by a dose of gr. 1 in 5 c.cm. of the same solvent. Thereafter twice-weekly doses of gr.  $1\frac{1}{2}$  were injected until the end of a month, when the patient was given a rest for one week. Then the injections were resumed until definite signs of healing were well established. Local treatment was rigidly carried out throughout.

At one time gr. 2 of potassium antimony tartrate were given twice weekly, but this produced

### EXPLANATION OF PLATE I

Fig. 1.—Case 7 (*see table*). Photograph taken four weeks after commencement of treatment. Sores were secondarily infected and the treatment lasted ninety days before a cure resulted. Patient frequently interfered with his treatment and rubbed filth into his sores. Treatment consisted of sixteen injections of potassium antimony tartrate and three of emetine with local application of normal saline.

Fig. 2.—Same case one month later.

Fig. 3.—Condition on discharge.

Fig. 4.—Early untreated case of oriental sore. Note the spread-out nature of the lesions which are not so typical as the lesions shown in the other photographs.

Fig. 5.—Case 29. Photograph taken three weeks after commencement of treatment. Shows two sores—one on face and one wrist. This case which was positive for *Leishmania tropica* was cured after two months' treatment with antimony and orisol.

Fig. 6.—Case 40. Photograph taken 14 days after commencement of treatment. Shows two lesions—one on face and one on wrist. The one on the face is a typical early sore. It was found to contain numerous *Leishmania tropica* (*see table*).

PLATE I  
Cases illustrating progress and results of treatment

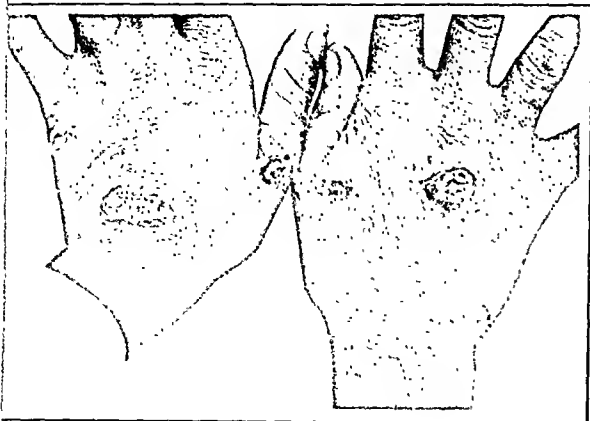


Fig. 1.



Fig. 2.

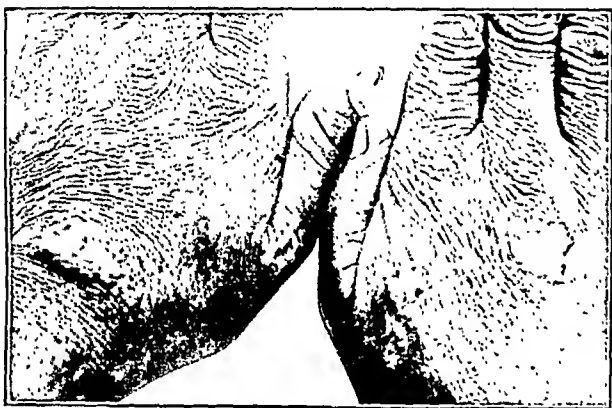


Fig. 3.



Fig. 4.



Fig. 5.



Fig. 6.

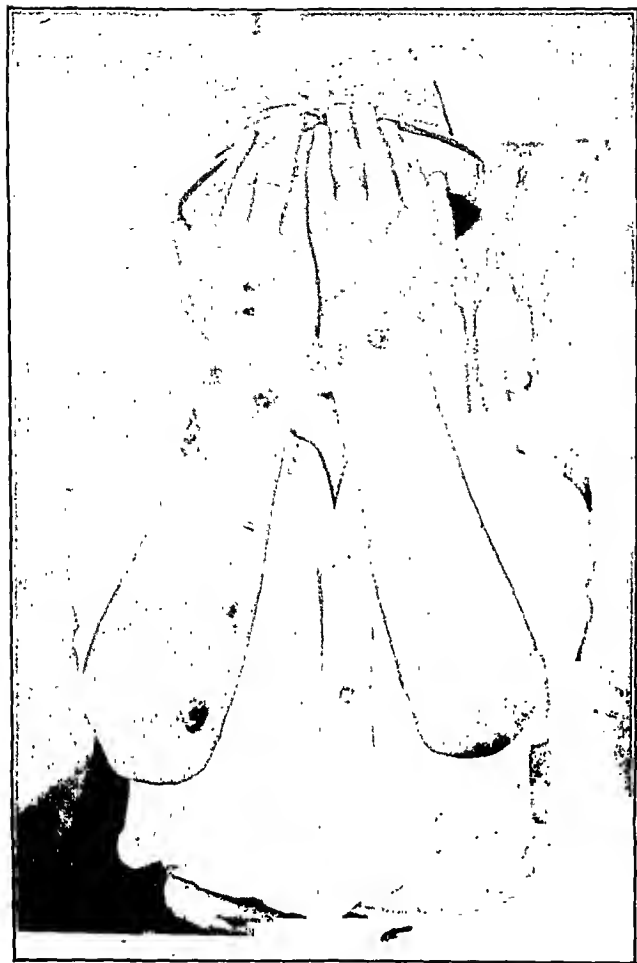


Fig. 7



Fig. 8.

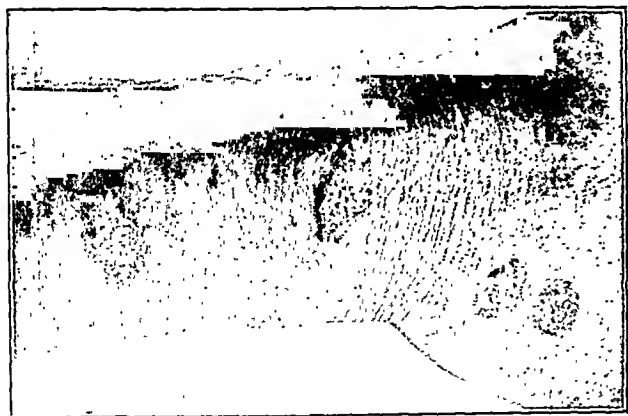


Fig. 9.

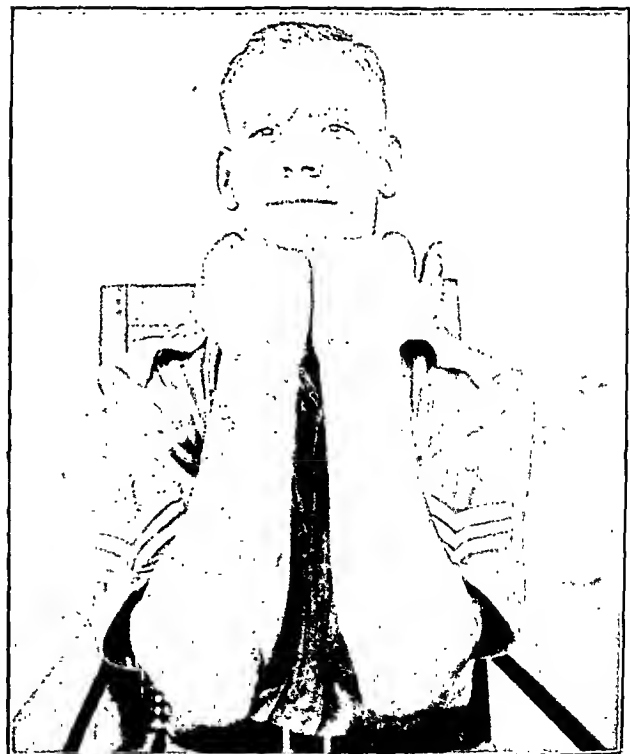


Fig. 10.



toxic symptoms, i.e., coughing, burning sensation in the throat, nausea and vomiting. Two men actually coughed up a little blood. Thus, although this treatment did seem to hasten the rate of healing, it was too dangerous to continue. The men were always excused duty on the days on which they attended for treatment.

The time taken for cases to heal varied tremendously. Some healed up rapidly after three or four grains with the addition of the local treatment, others required more than eighteen grains. The chronic cases were all secondarily infected. The first signs of healing were usually a drying up of the moist lesion followed by the formation of a hard crust which later peeled off leaving a white scaly and often itchy area. In addition the removal of the crust usually left a hollow behind and the ulcers eventually healed leaving marked scarring. Several men among the number sent to Quetta had suffered from oriental sore before but none of these became infected a second time.

*Emetine hydrochloride.*—Only one cure was obtained by using this drug alone in conjunction with local treatment. A reference to the table will show that twenty cases were treated with it, but, although some improvement was noted at the time, this improvement was only temporary.

The usual dosage was gr.  $\frac{1}{2}$  emetine hydrochloride in 3 c.cm. sterile distilled water for one large sore. This was repeated once a week. Some patients were given as much as gr. 2 at a time according to the number of sores treated. The drug was administered by injection into the edge of the sores and the surrounding tissues, the first signs of healing being the creeping in of the ulcer margin. Many cases, however, showed a false improvement. The margin of apparently healthy tissue crept in but later on turned a bluish colour, softened and ulcerated again. It was noted in treating cases with emetine that, unless the limb on which the ulcer being treated was placed on a firm support, the patient was apt suddenly to move it, jerking the needle out, so that a stream of emetine was directed upwards, more often than not into the doctor's eye. This resulted later in a painful conjunctivitis. Used in conjunction with antimony in certain chronic cases it gave good results, but was of very little use by itself.

*Orisol.*—This was used in twenty cases. On the whole the results were disappointing. Four cases were cured by this treatment alone in addition to local treatment. The minimum amount required was 5 c.cm. to cure two sores.

The dosage used was 1 c.cm. to 3 c.cm. per sore according to the size. It was a satisfactory form of treatment for single or small sores, but difficult and expensive in cases of multiple sores. Injections were made into the margins of the sores in four places so as to cover and infiltrate

the whole area. A few cases showed a rapid improvement by drying up and forming a scab which, when it fell off, left a healed area. Other cases, the majority, showed no appreciable change. The patients complained of pain at the time of injection but this soon disappeared.

*Neostibosan.*—Owing to the cost of this drug only one case was treated with it. He was given nine intravenous injections of gr. 0.3 neostibosan on consecutive days. In addition his sores, nine in number, were dressed with normal saline changed twice daily. He improved so much at the end of his course that he was allowed to leave hospital and attend for dressings. In the table are given details of the cases treated.

### Conclusions

1. Antimony in either its trivalent or pentavalent form is still the most effective and cheapest drug in the treatment of oriental sores.

The dose of potassium antimony tartrate should be regulated according to the weight of the patient and in any case should never exceed gr. 2 at one time. It must be carefully injected owing to the sloughing it causes if allowed to escape into the tissues. This is a severe drawback when one has to deal with large numbers of patients. One badly-injected dose causes so much pain to a patient that soon all hear of it and are apt to be nervous lest they too suffer in the same way.

In Roorkee with sometimes fifty men being treated at once there were three sloughs in the arm, during the whole period of treatment. If an accident has occurred and the arm is painful, then iodox is a useful application and gives some relief.

Neostibosan is expensive but is not so liable to cause sore arms or sloughing.

2. In chronic cases emetine hydrochloride gr.  $\frac{1}{2}$  to gr. 1 injected into the margins of the sores hastens the healing process produced by the antimony. This treatment is however rather painful.

3. Orisol (berberine), generally speaking, was not as successful as one might expect from the results claimed for it. For single sores or small lesions, before they have broken down, this drug gives good results. This latter conclusion was also arrived at by Napier (Knowles, 1934) some

### EXPLANATION OF PLATE II

Fig. 7.—Case 8. Photograph taken three weeks after date of commencement of treatment. Was discharged as cured after two months' treatment with potassium antimony tartrate and local dressings of saline, iodine, and boric acid.

Figs. 8 and 9 show close-up views of left and right hand and wrist of same case three weeks later.

Fig. 10.—Same case showing condition on discharge. Note the severe scarring which remains and a certain degree of pitting.



TABLE

Case number	Age	Minimum incubation period	Number of sores	Leishmania tropica found	Age of sore at commencement of treatment, months	Duration of treatment, days	NUMBER OF INJECTIONS AND TOTAL DOSAGE						Local treatment	Results of treatment
							Antimony		Emetine		Berberine sulphate			
							no.	gr.	no.	gr.	no.	c.cm.		
1	24	14 days	5	+	3	63	11	15½	2	1	2	Saline	Cured.	
2	22	"	10	—	6	35	10	9½	..	..	..	"	Ceased to attend.	
3	21	2 months	2	—	1½	23	5	4½	..	..	..	"	Cured.	
4	25	3 "	2	—	1	56	10	8½	2	1	..	"	"	
5	46	"	17	—	1	65	8	6½	2	1	..	"	"	
6	24	In Quetta *	2	—	3	31	6	4½	..	..	..	"	"	
7	20	1 month	8	—	1½	90	16	14½	3	1½	..	"	"	
8	30	In Quetta *	15	+	4	63	6	6½	..	..	..	Saline, iodine, boric acid.	"	
9	21	"	6	—	4	60	8	9½	..	..	2	6	Saline	"
10	27	1 month	5	+	2	101	14	17½	..	..	..	Saline Spirit, saline sealed.	"	
11	22	1½ months	4	—	2	66	9	11½	3	1½	2	6	Saline	"
12	24	In Quetta *	5	—	4	64	6	6½	3	1½	..	..	"	"
13	23	14 days	8	—	3	65	11	15	3	1½	..	..	"	"
14	..	3 months	2	+	10/30	35	3	2½	..	..	2	4	"	"
15	..	4 "	2	—	7/30	50	2	1½	..	..	..	..	"	"
16	..	"	3	+	10/30	57	3	2½	..	..	..	..	"	"
17	..	4 "	2	+	1	30	4	3½	..	..	..	..	"	Relapsed.
18	..	"	1	+	2	58	5	4½	..	..	1	3	"	On leave.
19	..	"	2	—	10/30	10	5	4½	2	1	..	..	"	Cured.
20	..	"	1	—	10/30	51	5	4½	..	..	4	9	"	"
21	..	"	2	+	10/30	70	6	5½	3	1	3	8	"	Relapsed.
22	..	"	2	—	9/30	57	8	10½	..	..	..	..	"	On leave.
23	..	"	4	+	7/30	16	3	2½	..	..	..	..	"	Cured.
24	..	"	1	—	7/30	19	2	2½	..	..	..	..	"	"
25	..	"	1	+	5/30	43	5	1½	..	..	2	5	"	"
26	..	"	5	+	1	104	5	4½	..	..	4	4	"	"
27	..	"	2	+	1	64	2	1½	1	1½	3	6	"	"
28	..	In Quetta *	4	+	7	50	4	3½	1	1½	3	6	"	"
29	..	2½ months	3	+	1½	104	3	2½	..	..	3	8	"	"
30	..	3 "	2	+	25/30	21	4	3½	..	..	4	10	"	"
31	..	3½ "	2	+	1	30	..	3½	..	..	..	..	"	"
32	..	1 month	2	+	3	30	4	3½	..	..	..	..	"	"
33	..	1 "	1	—	3	44	6	5½	..	..	..	..	"	On leave.
34	..	1 "	9	+	3	30	4	3½	..	..	..	..	"	Cured.
35	..	3 months	4	+	1	58	12	18½	2	1	3	6	"	"

\* Sores developed in Quetta, therefore incubation period is unknown.

TABLE—concl'd.

Case number	Age	Minimum incubation period	Number of sores	<i>Leishmania tropica</i> found	Age of sore at commencement of treatment, months	Duration of treatment, days	NUMBER OF INJECTIONS AND TOTAL DOSAGE						Local treatment	Results of treatment
							Antimony		Emetine		Berberine sulphate			
							no.	gr.	no.	gr.	no.	c.cm.		
36	..	4 months	3	—	7/30	58	4	3½	..	..	2	6	Saline	Cured.
37	..	3 "	1	+	1	53	3	2½	..	..	3	5	"	"
38	..	2 "	2	+	2	104	8	9½	..	..	7	10	"	"
39	..	1 month	10	+	3	34	2	1½	1	1	..	..	"	Relapsed.
40	..	3 months	3	+	1	70	5	4½	1	1	..	..	"	Cured.
41	..	3 "	1	+	20/30	24	4	3½	..	..	2	4½	"	"
42	32	4 "	9	+	5	72	11	15½	3	1½	3	7	"	"
43	22	14 days	1	+	4	62	5	4½	5	3½	..	..	"	"
44	30	1 month	2	+	3	55	..	..	..	..	..	..	"	Ceased to attend.
45	38	3 months	2	—	1	52	5	7	5	2½	2	4	"	Cured.
46	..	4 "	1	—	6/30	10	2	1½	..	..	..	..	"	"
47	30	In Quetta*	5	+	5	35	2	1½	2	3½	..	..	"	"
48	30	2 months	10	—	2	55	11	18	2	1½	..	..	Mag. sulph. foment., saline sealed.	On leave.
49	24	4½ "	3	+	2½	32	..	..	2	1	2	3	Saline	Cured.
50	..	4½ "	2	+	3	28	..	15½	..	2½	2	5	"	"
51	22	In Quetta*	2	+	3	114	13	15½	4	..	..	..	"	"
52	32	..	4	—	4	105	13	15½	..	..	..	..	"	"
53	27	3½ months	1	+	15/30	73	..	..	..	..	8	12	"	"
54	24	3½ "	2	—	4/30	50	6	5½	3	1½	..	..	"	"
55	30	3 "	2	+	2	97	10	9½	..	..	8	16	Copper sulph., saline sealed.	"
56	..	3½ "	1	—	1	70	..	..	..	..	6	6	Saline	"
57	..	3 "	3	+	1	106	10	9½	3	1½	1	2	"	"
58	..	5 "	2	+	10/30	40	3	2½	..	..	1	3	"	"
59	25	In Quetta*	9	+	9	97	11	10½	..	..	..	..	"	"
60	..	11 months	9	+	15/30	10	Neostibosan	..	..	..	..	..	"	Still under treatment.
61	24	6 "	2	—	5	85	9	8½	..	..	..	..	"	Cured.
62	22	5 "	2	+	2	85	10	9½	..	..	..	..	"	Still under treatment.
63	24	1 month	13	—	6	24	5	4½	..	..	..	..	"	Still under treatment.

\* Sores developed in Quetta, therefore incubation period is unknown.

years ago. Results with large or multiple sores are almost always disappointing.

4. Local dressings play a very important part in the rapidity of cure. There were many examples of patients who kept their dressings and sores clean which consequently healed up in from three to six weeks. There were many examples of others who were careless or ignorant and allowed their sores to become secondarily infected. They then took even as long as four months to cure.

Normal saline is a very satisfactory dressing, followed by iodine once healing has started.

5. Early treatment is most essential. The old-standing case is hard to cure: the recently developed case is comparatively easy to cure.

6. The total dosage of antimony required to effect a cure was less than is usually stated, due to the supplementary emetine or orisol and rigid local treatment.

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[Note.—There are surprisingly few clinical records—of a series of any significant size—of cases of oriental sore; we therefore welcome this contribution. There are a few points that seem to us to be of special interest.

*Incubation period.*—Circumstances made it possible to demarcate the minimum incubation

that the incubation period is quite frequently much longer than four months (Napier and Halder, 1936), yet the general impression on this subject is that it is *usually* shorter than

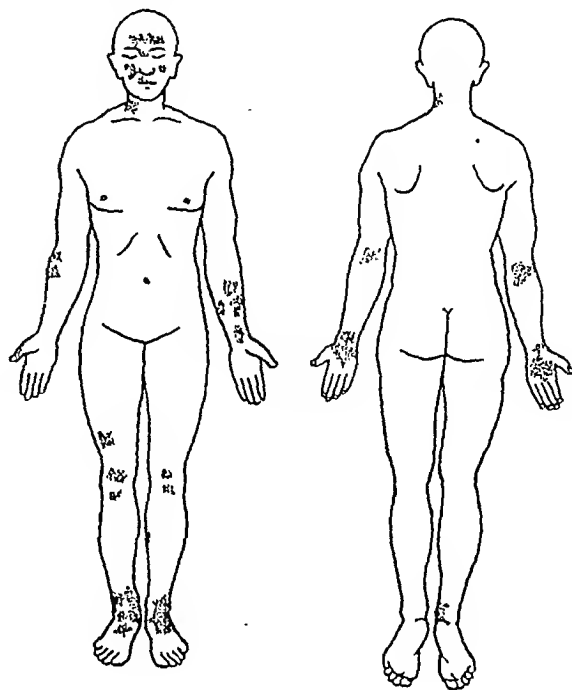


Fig. 12.—Leishmania —.

three months; this series indicates that this is not the case.

*Distribution.*—The spot maps shown here were kindly prepared by Captain Goodall at our suggestion. They bring out three points.

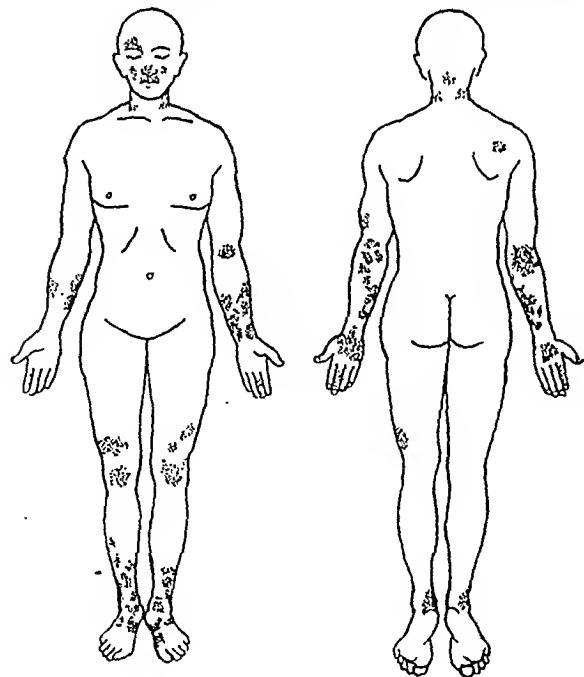


Fig. 11.—Leishmania +.

period. In 35 (or 56 per cent) it was three months or more, and in 12 (or 19 per cent) it was four months or more. Though it is known

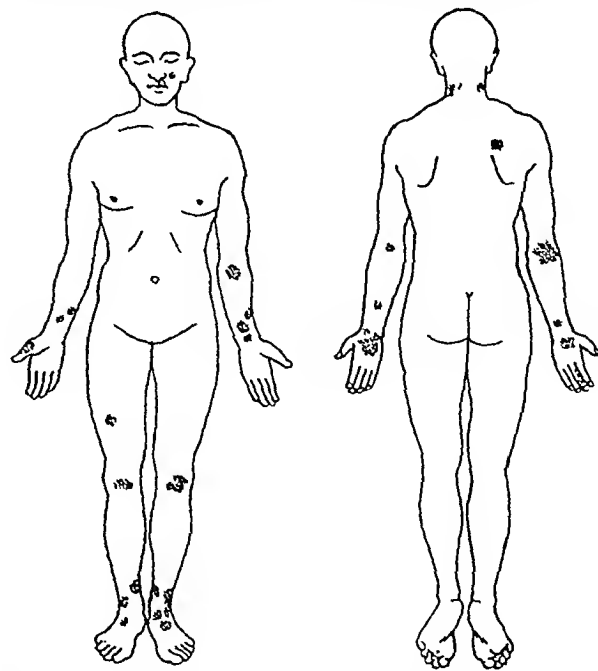


Fig. 13.—One or two sores only.

They confirm the observation, first emphasized by Acton (1919), that the sores occur on parts of the body most exposed to sandfly bites.

The distribution is much the same in those cases in which there are one or two sores and in those in which there are multiple sores. This suggests that the ætiology of the initial sore is the same as that of the other sores; that is, it negatives, in these cases, any suggestion that the infection has spread by the blood or the lymphatics.

Finally, as the distribution is practically the same in those cases in which leishmania was found and those in which it was not found, it seems probable that the latter group were true cases of oriental sore in which the parasites were scanty.

*Treatment.*—On the whole, the results of treatment seem to have been satisfactory. In 51 cases a cure was effected in an average period of about one and three-quarter months; in three others the sores reappeared; and in nine

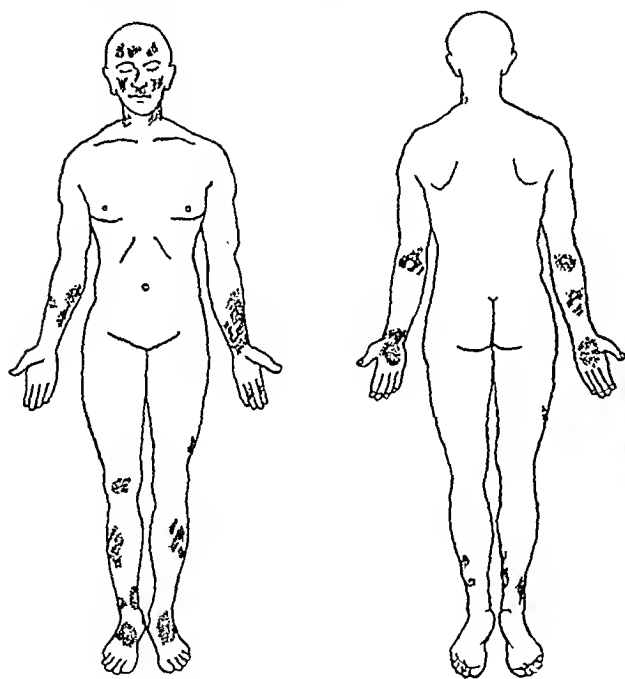


Fig. 14.—Multiple sores.

instances the results of treatment are not known.

From the point of view of appraising the value of the forms of treatment used, it is a pity that so much mixing of the different forms of treatment in the same individual had to be done, but research had to be sacrificed to utility, as the writer's primary objective was naturally to get the men back to duty as quickly as possible.

Of the 14 cases in which potassium antimony tartrate alone was given, the average duration of treatment was 48 days, but two of these relapsed. Of 16 cases in which more than one emetine injection was given in addition to the potassium antimony tartrate the average duration of the treatment was 60 days, but no relapses occurred; it is probable that in these cases

(Continued at foot of next column)

## THE CLINICAL ASPECT OF PLACENTA PRÆVIA AND ITS MANAGEMENT IN INDIAN CONDITIONS\*

By J. CHAKRAVERTI, M.B. (Cal.), M.C.O.G.

Associate Professor of Obstetrics and Gynaecology, Carmichael Medical College, Calcutta; Visiting Surgeon, Chittaranjan Seva Sadan, Calcutta; Honorary Visiting Gynaecologist, General Hospitals, Howrah, Calcutta

A PLACENTA is called 'prævia' when it is attached partly or wholly to the dilating zone of the uterus, viz, in the lower uterine segment. The condition produced goes by the name of 'unavoidable hæmorrhage' as the bleeding is inevitable. The condition has been known in the literature since the time of Hippocrates (de Lee, 1928) when it was thought to be prolapse of the normally-situated placenta. It forms one of the grave obstetrical complications as it constitutes the commonest important cause of antepartum hæmorrhage in the later months of pregnancy.

*Incidence:*—It is difficult to state correctly the incidence of this condition in India. The following table shows the number of cases in

\* Being a paper read at the First All-India Congress of Obstetricians held in Madras in January last.

(Continued from previous column)

emetine was given because the response to the antimony treatment was slow. In the one case in which emetine alone was used the result was undetermined. In three cases in which berberine sulphate alone was used the results were all satisfactory, but the duration of treatment was above the average.

We feel that the series has demonstrated the value of potassium antimony tartrate as the mainstay in the treatment of the disease; this is important in view of the very low cost of this substance. (The sodium salt is equally efficacious and cheap, and we have found it less toxic.) It also demonstrates that a judicious combination of intravenous antimony with some form of local treatment is probably the most effective way of treating the disease. The writer seems to favour emetine but there is little evidence in his table to support this preference, and we have always found berberine sulphate very effective for single sores.

The writer seems satisfied with the progress in the case in which he used neostibosan. Our experience has led us to suspect that the tri-valent antimony compounds are as effective as the pentavalent, but much more work needs to be done to establish this fact; we should like to see a large series in which sodium antimony tartrate, neostibosan, and foudadin were used on different cases.

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 —L. E. N., EDITOR, I. M. G.]



treatment is strongly contra-indicated in poor houses, in insanitary surroundings and also in cases of central placenta prævia.

The management can be dealt with according to the various methods at our disposal, but a better plan would be to consider the treatment according to the different clinical pictures the patients usually present.

For the convenience of treatment and according to the commonest conditions in which patients are found, the cases may generally be classified as follows :—

Group A.—When the patient is not in labour and the cervix is closed or just admits the tip of a finger in a multipara.

Group B.—When the patient is in labour or the cervix is dilated 2 fingers.

Group C.—Central—the placenta covers the whole of the internal os.

#### Group A

1. *In slight cases* (bleeding not exceeding 2 to 4 ounces)—*expectant treatment*—watchful expectancy with rest in bed and sedatives. Authorities differ in this line of treatment, once the diagnosis is established. In my opinion, a patient may be treated on these lines provided she is placed in a suitable environment, hospital or private house, where every possible arrangement has been made for emergency help. The signals of danger should be given to the nurse in writing and the armamentaria for the need of a case of placenta prævia should be kept ready. 'Expectant treatment is indicated in a case of an elderly primipara whose chance of becoming pregnant again is remote. It is contra-indicated in full-term pregnancy or when a patient is in labour and when the placenta covers the internal os, i.e., is central'.

2. *In moderate or severe cases*—*plugging*. This is the old Rotunda method prescribed for over a century (Eden and Holland, 1931).

Patients are often seen in the hospital that have been sent by private practitioners, as well as by other maternity homes under the City Corporation, after plugging which was performed in an improper and ineffective way. In order to be effective, this small but temporary life-saving operation in a case of placenta prævia must be done thoroughly and methodically. Plugging in a case of placenta prævia to be effective cannot be done without instruments of which only a few are necessary. It also requires good light, particularly in a private house, and an assistant to hold the legs. Plugging should be preceded by rupture of the membranes whenever possible and followed by application of a tight abdominal binder.

The patient should be catheterized every 8 to 12 hours. If no pain starts the plugs should be changed after 12 to 16 hours in the summer, 24 to 32 hours in the winter.

#### Group B

This is the commonest condition in which most of the placenta prævia cases are seen in India.

1. *If lateral (high placenta prævia)*.—Rupture the membranes and apply a tight abdominal binder. This is the ideal method of managing a case of placenta prævia with safety to the mother as well to the baby. In fact, this method contributes largely to lowering the mortality rate, but its application is limited only to this variety of case. Sometimes, rupture of the membranes has to be supplemented by forceps or craniotomy. Rupture of the membranes should never be done if the presentation is transverse.

2. *If marginal*.—Bleeding should be controlled by any one of the following methods and the remainder of the delivery left to nature, i.e., to be terminated slowly and spontaneously.

(a) *Pressure of half breech over the bleeding placental area*.—(i) In breech presentation—it is easy; a leg is to be brought down after rupturing the membranes. (ii) In head or transverse presentation (a) version, if possible external; otherwise bipolar followed by bringing down a leg. In the majority of cases, the head presents and external version is not possible and the cervix does not allow internal version—hence bipolar podalic version is the method of choice.

Bipolar podalic version (Braxton Hick's) is the old but efficient method of managing a case of placenta prævia. It can be performed anywhere and at any time and practically in all varieties of cases of placenta prævia, if the cervix admits only 2 fingers which in a case of multipara is not uncommon. The method requires only one assistant and practically no instruments, but some training on the part of the obstetrician is of immense value. After version a foot is brought down to the vulva, heel pointing upwards and traction is put on just sufficient to stop bleeding. No time should be lost to find out the upper or lower leg. Difficulties may be experienced, (i) in rupturing the membranes which are not always easy to reach in a case of placenta prævia, (ii) in turning the child if the legs are extended, (iii) in finding the leg (a mistake may be made with a hand), and (iv) the leg may slip from the hand near the internal os. These difficulties are to a certain extent caused by want of experience. During the efforts to overcome these difficulties, a patient in the hands of a young specialist may bleed profusely. In such an eventuality, it is advisable that the obstetrician should change his line of action. Plugging should be resorted to to stop bleeding and the patient treated for loss of blood; otherwise his firm determination is sure to cause disaster. This is the first part of the treatment which should be performed quickly but methodically. The remainder of the management should be left to nature and

TABLE  
*Placenta prævia*

	Year	Total labour cases	Total no. of P. P. cases	GRAVIDA		Morbi- dity	MORTALITY		Cause of maternal death.
				Multi- para	Primi- para		Maternal	Fœtal	
Chittaranjan Seva Sadan, Calcutta	1930	800	11	10	1	7	0	10	{ Hæmorrhage .. 2 Sepsis .. 1 Hæmorrhage .. 1 Sepsis .. 1 Hæmorrhage .. 2 Sepsis .. 1 Hæmorrhage .. 1
	1931	1,212	22	17	5	6	3	15	
	1932	1,355	23	20	3	20	2	15	
	1933	1,879	17	15	2	3	3	11	
	1934	2,084	29	28	1	12	1	16	
Carmichael Medical College, Calcutta	1930	412	6	5	1	2	0	3	{ Sepsis .. 1 Hæmorrhage .. 1 Heart failure .. 1 ? .. 1 Hæmorrhage .. 1 ? .. 1 Peritonitis .. 1
	1931	553	8	6	2	4	2	6	
	1932	756	14	12	2	5	2	9	
	1933	873	12	8	4	3	1	7	
	1934	1,302	9	6	3	6	2	4	
Eden Hospital, Medical College, Calcutta	1930	1,544	21	21	0	5	3	7	{ Shock .. 1 Sepsis .. 1 Bronchio-pneu- monia .. 1 Shock .. 2 Pulmonary embolism. Cæsarean sec- tion, shock. Shock .. 1 Sepsis .. 1 Hæmorrhage and shock .. 1 Shock .. 1
	1931	1,712	29	28	1	5	3	7	
	1932	1,932	19	19	0	4	1	4	
	1933	2,070	26	25	1	3	2	7	
	1934	2,207	22	21	1	3	2	6	
Government Hospital for Women and Children, Egmore, Madras	1930	3,059	21	19	2	7	3	15	{ Shock .. 1 Hæmorrhage .. 1 Rupture of uterus .. 1 Hæmorrhage .. 3 Shock .. 1 Shock .. 2 Hæmorrhage .. 1 Sepsis .. 1 Hæmorrhage and shock .. 4
	1931	3,119	24	22	2	4?	4	17	
	1932	3,174	16	15	1	?	3	11	
	1933	3,371	14	11	3	?	0	9	
	1934	3,355	35	31	4	8	5	29	
The Nowrosjee Wadia Maternity Hospital, Bombay	1930	..	..	..	Not available	..	..	..	{ Shock .. 1 Hæmorrhage .. 1 Moribund .. 2 Shock .. 1
	1931	4,106	31	26	5	8	2	26	
	1932	3,944	24	23	1	4	0	20	
	1933	4,302	24	22	2	5	3	20	
	1934	4,272	43	36	7	7	0	21	

*Summary of table*

Calcutta—Eden Hospital	..	12 per cent
Carmichael Hospital	..	12 " "
Chittaranjan Seva Sadan	..	13 " "
Calcutta	Average	.. 1.2 per cent
Madras	..	0.6 " "
Bombay	..	0.8 " "
Incidence in India	..	0.83 " "
Incidence in the British Isles	1.1	" "
Incidence in America	varies widely—about 1 in 200	

5 years in the big hospitals of Calcutta, Madras and Bombay.

Thus, it will be seen from the above that the incidence of this condition in India is about 1 in 100. But it will certainly be higher if private cases are considered along with those in hospitals because, in India, unlike other countries in Europe and America, a fairly large number of cases, particularly those belonging to conservative families, are treated in private houses.

*Morbid anatomy.*—Under normal conditions the placenta is attached to the body of the uterus, most commonly to the posterior wall and less frequently to the anterior and lateral walls. In the last situation, however, it considerably encroaches on the anterior and posterior walls. The rarest place is the fundus (de Lee, 1928).

Although it is customary to classify the condition clinically into (i) central, (ii) marginal and (iii) lateral, a good deal of confusion still exists as there is some difference of opinion about the definition of the marginal and lateral types. Better terms would be complete or central and incomplete or non-central. Even then, these terms are more or less relative to the dilatation of the cervix. For instance, a placenta prævia which is central in position in the early stage of labour becomes marginal at the end of the first stage. Hence it would be appropriate to define the types with reference to the condition of the cervix, *e.g.*, central with 2 fingers dilatation of the cervix, and so on.

Besides the abnormal anatomical position, the placenta in this condition is usually bigger than normal, occupying a larger surface area. Naturally, it is thinner than normal due to poor vascularity of the lower uterine segment. The insertion of the cord is very often marginal or velamentous (Williams, 1931). Frequently infarcts are seen on the surface and sometimes there is foetal anomaly, as may be seen from case 1.

*Symptomatology.*—Placenta prævia has but one cardinal symptom, *viz.* visible hæmorrhage, which may be slight, moderate or severe and even, in some cases, fatal. The bleeding is spontaneous, *i.e.*, 'causeless'. It is painless and comes on suddenly without any warning, usually in the third trimester of pregnancy. Fortunately, bleeding in the first instance is usually slight in amount but it recurs at intervals of a few days or weeks. After the first appearance of bleeding, the subsequent attacks are precipitated by the slightest movements, *e.g.*, jolting or jerking, as in motoring or the act of coitus. The hæmorrhage is usually severe in the case of central and least in the case of lateral variety. Rarely, a case of lateral placenta prævia may bleed severely whereas a central one bleeds only when there is considerable advance in labour. Probably it depends more on the elasticity and contractility of the

tissue to which the placenta is attached than merely on its anatomical position.

The condition is much more common in multipara than in primipara. The occurrence in relation to parity, multipara to primipara, is as follows :—

Calcutta	..	..	5 : 1
Madras	..	..	8 : 1
Bombay	..	..	8 : 1
<hr/>			
Average for India	..	..	6 : 1
<hr/>			
British Isles	..	..	5 : 1
America	..	..	10 : 1

The sources of the bleeding are mainly the utero-placental sinuses and, in rare instances, the villi which are traumatized by the examining fingers (Eden and Holland, 1931). The question may be asked, why does a placenta prævia bleed? The reason is obvious when the patient is in labour as the cervix is drawn up like a sleeve over the placenta which lies in front. But a satisfactory explanation cannot be given when bleeding starts say at 28 weeks or before labour. Probably at this stage of pregnancy, the lower uterine segment which begins to form stretches gradually and the mature and fully-formed placenta attached to this part cannot keep pace with it. Naturally it becomes separated from the uterine wall, leaving open some of the utero-placental sinuses. This leads to the question of the origin of the lower uterine segment, which is one of the unsolved and controversial points in obstetrics. Personally, I think it grows from the isthmus which has a separate origin, distinct anatomical and histological features and separate nerve and blood supplies. This has been definitely proved by Prof. Oskar Fraenkle of Vienna in the 9th Congress of the Obstetricians and Gynecologists of the British Empire at Birmingham in 1933. The other factor that keeps on the bleeding is the poverty of the musculature of the lower uterine segment in contrast with the body or upper uterine part. Normally the sinuses are closed only by the contraction of the muscular tissues which are deficient in the lower uterine segment.

*Diagnosis.*—The existence of placenta prævia is usually elicited by physical examinations—(a) abdominal, (b) vaginal; a definite diagnosis can only be made by *vaginal examination*. Before making a vaginal examination in a suspected case of placenta prævia the practitioner must be warned about two points which are of great practical importance: (i) *Rigid aseptic* precautions, as if one was going to perform a major operation. This applies both to the maternal parts as well as to the examining hands. (ii) Some suitable packing material such as sterile gauze or cotton should be kept ready by the side of the examiner. This may



be necessary to control the bleeding, which usually takes places immediately after the examination, particularly in a private house and in a patient who has already been exsanguinated.

Recently, radiographic diagnosis of placenta prævia has been successfully performed by Francis Burke (1934 and 1935). Amniography was done after injecting the amniotic sac through the abdominal wall, with some radio-opaque substances, e.g., uroselectan, or strontium iodide. The filling defect of the gestation sac shows the position of the placenta in the uterus. This is a distinct advance in the scientific methods of diagnosing a suspected case of placenta prævia before bleeding starts.

The diagnosis is to be made from other conditions which give rise to antepartum hæmorrhage, of which the most important is accidental hæmorrhage or ablatio placenta. This condition is always associated with pain in the abdomen and a certain amount of shock. The blood is more or less mixed with dark clots. The uterus is tender and board-like to the touch. The condition is often accompanied by the presence of albumin in the urine. The fœtal heart sound disappears early.

It would be a wise principle to observe that, even in the absence of a positive finding, a painless and 'causeless' bleeding in a woman at the third trimester of pregnancy should be considered as due to placenta prævia and treated as such until there appears some positive evidence to prove it otherwise.

*Prognosis.*—It is one of the most difficult problems in obstetrics to prognose a case of placenta prævia. A case of lateral placenta prævia, which in the beginning appears easy and simple, ultimately becomes very severe and in some cases turns out to be fatal.

*The prognosis depends on the following factors :—*

(i) The condition in which a particular case first comes under treatment—if the patient has been received in an exsanguinated condition the prognosis is certainly not so favourable. Prognosis differs widely in 'booked' and emergency cases (Monro Kerr, 1933); 'booked' cases—3.1 per cent, and emergency—10.1 per cent death rate.

(ii) Environment—the outlook is certainly good if the patient is placed in the early stage in a well-organized maternity hospital equipped for abnormal cases.

(iii) The success depends more upon the skill of the attendant than upon any other single factor. To repeat the words of Rudolph Holmn (Davis, 1935)—'procrastination spells disaster in cases of placenta prævia'. At the same time it is equally true that injudicious and untimely interferences contribute a large share in causing high mortality, whereas the simplicity of operative procedures and its perfection materially alter prognosis.

(iv) Degree of prævia—it is always worse in central but fairly good in lateral.

(v) Postpartum hæmorrhage—this, even in small amount, which is of little significance in normal labour, is of material importance in a case of placenta prævia which has already been exsanguinated.

(vi) Infection—next to shock and hæmorrhage it is responsible for the high maternal mortality. In a five years' return (1926 to 1930) of the Glasgow Maternity Hospital—30 per cent deaths were due to sepsis. Referring to the table one finds that in the first two hospitals 6 out of 16 deaths were due to sepsis, i.e., 37 per cent. This high maternal mortality in Bengal resulting from sepsis is due to the fact that nearly every patient was an emergency case and the tissue resistance and the vitality were very low on account of the prevalence of anæmia, malaria, kala-azar, etc. Hence the importance of maintaining rigid asepsis in making vaginal examinations in a suspected case of placenta prævia and also in any operative procedure. Infection is more common in cases following plugging adopted as a method of treatment.

*Management.*—As the condition is not preventable its treatment does not come under preventive midwifery although cases diagnosed in the antenatal clinics and kept under observation show better prognoses.

There are few more debated subjects in obstetrics than the treatment of placenta prævia. Before dealing with it, it is essential that the patient should be placed in the best environment. In this respect a well-equipped maternity hospital is the best, particularly in a case of central variety. In fact, the improvement in the mortality rate of this condition will depend largely on early hospitalization of the patient. Next preference goes to nursing homes. Unfortunately, these homes have not received much sympathy and popularity in this country, particularly in Bengal, excepting for special occasions. Europeans mostly patronize these homes; amongst the native population, few can do so because of lack of funds, social prejudices, etc. Conditions in these homes are much better in Bombay and Madras.

Lastly, comes the treatment in a private house. Of course, there is much to deprecate the domiciliary treatment of placenta prævia. In fact, in the British Isles, it is not generally adopted. But one has to modify the line of treatment according to the social customs and other prejudices prevalent in the country. In treating a case of placenta prævia in a private house, the practitioner with his assistants should be in constant attendance. He should not take any other emergency case in hand. All the armamentaria for use in a case of placenta prævia should be kept ready and the obstetrician should be within easy reach. Neglect to observe this rule sometimes causes disaster in a private house. But in any event, domiciliary

treatment is strongly contra-indicated in poor houses, in insanitary surroundings and also in cases of central placenta prævia.

The management can be dealt with according to the various methods at our disposal, but a better plan would be to consider the treatment according to the different clinical pictures the patients usually present.

For the convenience of treatment and according to the commonest conditions in which patients are found, the cases may generally be classified as follows :—

Group A.—When the patient is not in labour and the cervix is closed or just admits the tip of a finger in a multipara.

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Group C.—Central—the placenta covers the whole of the internal os.

#### Group A

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The patient should be catheterized every 8 to 12 hours. If no pain starts the plugs should be changed after 12 to 16 hours in the summer, 24 to 32 hours in the winter.

#### Group B

This is the commonest condition in which most of the placenta prævia cases are seen in India.

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(a) *Pressure of half breech over the bleeding placental area*.—(i) In breech presentation—it is easy; a leg is to be brought down after rupturing the membranes. (ii) In head or transverse presentation (a) version, if possible external; otherwise bipolar followed by bringing down a leg. In the majority of cases, the head presents and external version is not possible and the cervix does not allow internal version—hence bipolar podalic version is the method of choice.

Bipolar podalic version (Braxton Hick's) is the old but efficient method of managing a case of placenta prævia. It can be performed anywhere and at any time and practically in all varieties of cases of placenta prævia, if the cervix admits only 2 fingers which in a case of multipara is not uncommon. The method requires only one assistant and practically no instruments, but some training on the part of the obstetrician is of immense value. After version a foot is brought down to the vulva, heel pointing upwards and traction is put on just sufficient to stop bleeding. No time should be lost to find out the upper or lower leg. Difficulties may be experienced, (i) in rupturing the membranes which are not always easy to reach in a case of placenta prævia, (ii) in turning the child if the legs are extended, (iii) in finding the leg (a mistake may be made with a hand), and (iv) the leg may slip from the hand near the internal os. These difficulties are to a certain extent caused by want of experience. During the efforts to overcome these difficulties, a patient in the hands of a young specialist may bleed profusely. In such an eventuality, it is advisable that the obstetrician should change his line of action. Plugging should be resorted to to stop bleeding and the patient treated for loss of blood; otherwise his firm determination is sure to cause disaster. This is the first part of the treatment which should be performed quickly but methodically. The remainder of the management should be left to nature and

all the rules of a breech presentation should be strictly followed. Traction is to be applied only when bleeding starts and the amount should be just sufficient to stop bleeding. The motto should be *quick version and slow extraction*. During the valuable interval in between, the patient should be treated for loss of blood. Negligence to observe this rule often causes disaster; I have seen patients, both in hospitals and in private houses, brought actually to a critical condition due to non-observance of this rule by young obstetricians, who in their attempt to secure 'double honours' institute early traction. It should always be remembered that *safety of the mother is always the first thing, and should not be sacrificed for the sake of the child*. It should never be forgotten that *anæmic patients stand shock very badly* and it is nowhere more true than in India because under normal condition the blood of the average Indian woman is much poorer than that of her European sister. This can be easily seen from the following figures:—

Healthy women between 16 to 35 years (1934) (Dhar, 1934-1935).	Bengali Hæmoglobin (gram)	Erythrocytes (millions)	Colour index
	11.47	3.73	0.995
Healthy English women, the same age (Ben Jones).	13.9	5.01	1.00

Further, injudicious and energetic traction easily cause extensive laceration of the cervix in a case of placenta prævia, resulting in post-partum hæmorrhage.

In my personal experience both in hospital and private practice, the proper management of placenta prævia by this method terminates labour spontaneously in two to six hours after bipolar podalic version and in the majority of the cases with living children, unless the patient had already bled sufficiently to cause intra-uterine death, or a badly asphyxiated condition, of the child. Sometimes, the after-coming head requires some assistance.

(b) *If the head presents and the child is living:—Scalp traction is equally effective.*—This method was introduced by the late Dr. Willett (Bourne and Williams, 1932) in 1923. His preliminary report was based upon only a few cases in the City of London Lying-in Hospital. At first he used an ordinary strong volsellum and subsequently improved the instrument, which goes by his name (Willett forceps). Conditions to be fulfilled for its application are:—

- (i) the cervix must admit two fingers, loose,
- (ii) the patient should be in labour and
- (iii) the child must be living and there must be a head presentation.

The membranes are ruptured and the forceps applied, taking a good grip of the scalp.

My personal experience of this method is very limited. It is not always easy to apply the

forceps on the head, which is usually floating in placenta prævia, and to take a good bite of the scalp. Besides, unless it is applied near about the occipital region, there will be extension of the head, which causes difficulty in engagement under normal condition, far more so in a case where the lower uterine segment is occupied by the placenta. Sometimes, the scalp is cut through; this gives rise to sepsis which a newborn baby stands badly. Traction sufficient to stop bleeding only is required, i.e., average 1 to 2 lbs. to the handle of the forceps connected with a pulley at the foot end of the bed.

(c) *The pressure of a hydrostatic bag.*—15 years ago this was the standard and favourite method of treating a case of placenta prævia. The bag has now become an obsolete instrument in hospitals in Calcutta, and it has fallen into disrepute in the hands of British obstetricians; there are many reasons for condemning its use. But in America the application of the hydrostatic bag still enjoys a high reputation in nearly every clinic.

(d) *Plugging:—Cervico-vaginal.*—Once a favourite method of treatment in this variety of placenta prævia, it is not very popular now. The gradual decline in popularity is probably due to—

- (i) Unreliability of controlling hæmorrhage. Following this method the bleeding which sometimes continues may become either external or internal.
- (ii) Sepsis following plugging is high, giving rise to an increase in morbidity.
- (iii) Displaces the presenting parts.
- (iv) Often requires other methods to supplement it.
- (v) Possibility of rupture of the uterus if plugs are not timely removed—at least plugging was the only interference in H. D. De Sa's case of spontaneous rupture of the uterus in placenta prævia mentioned below.

Still, cervico-vaginal plug has a place as a method of treatment in cases of placenta prævia,

- (1) as ambulatory treatment,
- (2) when bipolar version fails, and
- (3) in central placenta prævia when the patient's condition is too low for Cæsarean section.

(e) *Cæsarean section.*—The increasing popularity of the Cæsarean section has led to its widespread application in the hands of young obstetricians and it has replaced the art of midwifery in several conditions. This encouragement is simply due to its low mortality. Perhaps this is a transitional phase and a sufficiently long experience will turn the balance in the opposite direction. To a serious and thoughtful obstetrician the application of Cæsarean

section in marginal placenta prævia is limited to, (i) rigidity of the cervix and other obstruction to vaginal manipulation, (ii) elderly primipara—if the patient be very anxious for a child, and even in such a case the condition of the child and the possibility of prematurity should be duly considered.

#### Group C

It has already been mentioned that hospital is the best and safest place for such cases. Cæsarean section is to be performed if the patient's condition is good. If the patient has already lost a considerable quantity of blood, plugging should be resorted to followed by treatment for the loss of blood by saline or blood transfusion. When the patient's condition improves, labour should be terminated by classical Cæsarean section, irrespective of the child's condition. If the patient is in unfavourable surroundings, where Cæsarean section is not possible or safe or the medical attendant is not skilled to abdominal surgery, rupture of the membranes by going through the placenta and bringing down a leg should be adopted. Considerable hæmorrhage may take place, but there is no other alternative in such circumstances. In fact, this is the only method of treating a case of central placenta prævia in rural areas where there is no facility for opening the abdomen.

Further, if the patient is brought in a collapsed condition, which is not a rare event in obstetric practice in our country, the patient should be carefully removed from the ambulance and treated for shock and loss of blood. These patients have little blood to lose, hence no interference should be attempted till they come round. Usually these cases are fatal within a few hours.

Next comes the *management of the third stage*. The importance of smooth performance of this stage of labour in a case of placenta prævia cannot be over-estimated. A large percentage of cases of placenta prævia suffer from postpartum hæmorrhage and some of them in such profuse amounts that the patients die before anything can be done for them. Postpartum hæmorrhage even of moderate degree, which is of no significance in an otherwise normal case, becomes a lethal factor in a case of placenta prævia which has already been exsanguinated. If the placenta is not cast, it should be squeezed out or manually removed without delay. If the placenta is cast, intra-uterine plugging should be done followed by treatment for loss of blood. Tentative methods to arrest bleeding should not be adopted.

#### Saline transfusion

The urgent necessity for saline transfusion in a case of placenta prævia cannot be over-estimated. In fact, it is the team work of immediate saline transfusion and skilful, prompt and judicious surgical or obstetrical

interference, combined with safe anæsthesia, which brings success in a desperate case of placenta prævia in a well-equipped maternity hospital. In private houses, the saline-transfusion apparatus should be kept ready as a routine practice in any case of placenta prævia. A case, which in the beginning appears mild and simple, often turns out to be severe and complicated as the labour advances and interference commences.

#### Blood transfusion

The most efficient and scientific way of treating a case of acute hæmorrhage is by supplying the system with the same vital fluid. If carefully performed, it is practically devoid of risk. In fact in nearly every clinic in the British Isles a case of placenta prævia is 'grouped' immediately on admission and the suitably-matched registered donor is informed and kept within easy reach. In Bengal, transfusion has not acquired such popularity yet, possibly due to want of suitable organization and partly due to social prejudice and ignorance of the people.

The responsibility of the accoucheur does not end with the termination of labour. A patient in a private house should be watched for bleeding for at least four hours before she is handed over to a nurse and things for plugging should be kept ready during this period.

#### Morbidity

A considerable number of cases run a morbid temperature and some of them are definitely septic. In a five-year return of the hospitals in Calcutta we find the following figures :—

	Per cent
Eden Hospital .. ..	18
Carmichael Medical College Hospitals	45
Chittaranjan Seva Sadan ..	49
Average morbidity, Calcutta ..	37
Madras .. ..	15
Bombay .. ..	19.7
Average morbidity in India ..	24

Hence precautionary measures should be taken to cope with it. In a suspected case, serum in adequate doses should be administered early. The patient's strength should be maintained by easily assimilable diet with plenty of glucose, stimulants and vitamins.

*Mortality*.—According to the table under review, the average mortality rate of placenta prævia treated in Indian conditions is 9 per cent.

	Per cent
Eden Hospital .. ..	9.7
Carmichael Medical College Hospitals	14.25
Chittaranjan Seva Sadan ..	9
Average mean figures :—	
Calcutta .. ..	Per cent
Madras .. ..	11
Bombay .. ..	13
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Credit is due to the staff of the Nowrosjee Wadia Maternity Hospital, Bombay, one of the biggest institutions in India, where the average mortality is only 4 per cent. In the years 1932 and 1934, the number of cases of placenta prævia treated in this hospital were 24 and 43, respectively, without any mortality. These are not only the lowest figures in India but certainly far below those in many hospitals in the British Isles.

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This low mortality in the Bombay Hospital may be due either to many cases being diagnosed in the antenatal clinics or perhaps the women in Bombay are more frightened of bleeding than their sisters in other provinces and go to hospital early; naturally, the hospital receives them in a better condition. But one interesting fact which cannot be overlooked is that the methods of treatment in this hospital were rupture of the membranes and version, with occasional application of Willet's forceps. Perhaps these methods of treatment formed an important factor in producing such brilliant results.

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The statistics of the important hospitals of Calcutta, Madras and Bombay have been considered with special reference to the incidence, parity, morbidity and mortality. The management of the condition has been fully dealt with from the point of view of the commonest conditions in which patients are generally seen in Bengal. Practical difficulties as encountered in India in the course of treatment have been explained and the methods of coping with them have been described.

Interesting cases have been fully described.

*Case 1.*—Age 18, admitted to the Carmichael Medical College Hospitals on the 17th September, 1935, at 0-15 p.m., with a history of seven months' amenorrhœa complaining of sudden distension of the abdomen for four days, and slight pain in the lower abdomen for 24 hours.

She was a primigravida. The height of the uterus was to the level of the xiphoid cartilage; it was globular in outline, prominent in front, very tense but not tender, thrill present. The skin over it was tense and shining. The foetal parts were not felt, nor was the foetal heart sound heard. Pulse/resp. rate = 114/22, volume and tension good.

*Per vaginam.*—Os two fingers dilated, cervix thick, head presenting, membranes present but not tense. The patient bled slightly during examination and on further exploration placental tissue was felt in the left post-lateral quadrant of the cervix. The membranes were ruptured with a Kocker's forceps but only 2 to 3 ounces liquor amnii came out. The head was low down in the cavity. The height and tension of the uterus remained the same. An attempt at scalp traction, cut

through the scalp. As there was no active bleeding, the patient was kept on the table under watchful expectancy and given sedatives. A diagnosis of twins with hydramnios of the second sac, complicated by lateral placenta prævia, was made.

At 8-10 p.m., when the cervix was taken up and the os was 3 fingers, loose, a dead and partly mummified child was born spontaneously. The membranes of the second sac were ruptured artificially and six pints of clear fluid came out, followed immediately by the delivery of a dead but not mummified child with talipes of both feet. The placenta followed the birth of the child. It was uniovular with only two amniotic sacs. There was no post-partum hæmorrhage. The patient had an uneventful puerperium.

It was an interesting case of twin pregnancy with acute hydramnios of the second sac and talipes of the second foetus complicated by lateral placenta prævia.

*Case 2.*—Age 28, admitted to Chittaranjan Seva Sadan at 8-40 a.m., on 27th July, 1935; she came in from Bugnan, about 20 miles from Calcutta, with history of (i) amenorrhœa for nine months, and (ii) painless profuse bleeding for the last five days, off and on, with sudden onset and no labour pains.

Temperature 100.4°F. Pulse/resp. rate = 124/30. Pulse soft and irregular; respiration, somewhat difficult. She was very anæmic, extremities cold, and not responding to questions properly. Heart sounds weak and quick; lungs—clear.

The uterus was the size of eight months' pregnancy, soft, not tender; no painful contraction present. No foetal heart sounds. Head presenting and floating.

*Per vaginam.*—Vagina full of blood clot, cervix taken up considerably, admitted 2 fingers.

Placental tissue felt in the left post-quadrant. The patient started bleeding freely. The membranes were ruptured, about 10 ounces of liquor amnii drained out and the cervix and vagina tightly plugged with gauze and cotton-wool. The bleeding stopped. A sterile pad and a tight abdominal binder put on. The pulse of the patient became very soft, feeble, rapid and irregular.

Subcutaneous saline Oii given statim; oxygen inhalation; foot end of the table raised. The patient kept warm under blanket and hot water bottles to the sides.

At 10-30 a.m.—Normal saline Oii.	} Intravenously.
Glucose 25 per cent 40 c.c.	
Cardiozol 1 c.c.	Hypodermically.

8 p.m.—The pulse condition slightly improved but still soft and rapid not justifying any interference.

Pulse/resp. rate = 120/40. Temperature 100.6°F. There were no labour pains and no blood discharge *per vaginam*. The patient complained of pain all over the body—some evidence of reaction.

Rectal saline 6 oz. every four hours continued.

3 a.m.—Pulse imperceptible in both wrists. Heart sounds foetal in character 146; respiration 46, laboured. No blood discharge *per vaginam*—uterus contracting, now and again; adrenalin 1 c.cm. injected.

6 a.m.—The condition gradually grew worse and the patient expired.

After death, on removal of the vaginal plug a good amount of fluid blood came out through the cervix and the placenta was found separated considerably. These revealed that hæmorrhage continued and remained concealed after plugging; this was probably the cause of death.

*Case 3.*—Age 24, fourth pregnancy, admitted to Chittaranjan Seva Sadan at 5-45 p.m. on 7th November, 1934, with history of (i) amenorrhœa for ten months and (ii) sudden onset of bleeding since 4 p.m. not attended with any pain, temperature 99.6°F., pulse/resp. rate = 100/22.

Uterus size of ten months' pregnancy, soft, no pain, foetal parts easily palpable. Head presenting, high up and floating.

Foetal heart sounds in the right lower quadrant. *Per vaginam.*—Bleeding present; cervix nearly taken up; os 2 fingers, loose through the cervix the placental tissue only felt all round; head presenting high up.



The patient started bleeding profusely immediately after examination.

6-15 p.m.—Vagina was tightly plugged with iodoform gauze and cotton-wool—without rupturing the membranes.

The patient was prepared for Cæsarean section. She was restless but had no pain; pulse 120 soft and volume small.

Temperature 98°F. Blood pressure 90/75.

Normal saline 0.5 ss

Glucose 25 per cent 50 c.c. } Intravenously.

Continuous oxygen given.

9 p.m.—The patient's condition improved slightly; restlessness disappeared. Pulse soft and moderate tension; classical Cæsarean section was performed—baby living, male, 6 lb., though asphyxiated it revived—no post-partum hæmorrhage. The usual post-operative treatment was done.

The patient recovered from the shock without any trouble and the baby started breathing easily.

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This was a case of central prævia with severe bleeding, treated by vaginal plugging, followed by Cæsarean section.

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## PUERPERAL SEPSIS : A REVIEW

By P. C. DUTTA, M.B., F.R.C.S.(E.), D.G.O.  
CAPTAIN, I.M.S.

Civil Surgeon, Jullundur

A good deal of work has lately been done by various clinicians and laboratory workers on this subject. Some of the results are very useful while others are of doubtful utility. A summary of our present state of knowledge may help that most useful medical member of society, the general practitioner.

It has been very rightly said by Solomons (1931) that the best treatment of puerperal sepsis is prevention. The first essential to attain this is to maintain the physical condition of the mother, so that she may be able to resist infections. This can best be achieved by proper antenatal care, adequate nutrition and the prevention of anæmia. Secondly, the attendant must be thoroughly conversant with the mechanism of labour. This will restrict meddling midwifery to the minimum, no interference will be made before it is really indicated, there will be no unnecessary use of forceps, operations, and so on. The attendant must be able to gauge the powers of the uterus, when and how far it has to be helped and when it has to be soothed. This can only be acquired by thorough training and careful observation of cases throughout labour. Thirdly, the knowledge of the source of infection and methods of prevention. It must be realized that it is the neglect of simple things that cause 80 per cent of puerperal infection.

Without going into unnecessary details and discussions it can safely be stated that in nearly all cases of sepsis the infection is caused by introduction of organisms from outside. They may be introduced by the attendant or by the patient herself. Dora Colebrook (1935) and Griffith (1934) found that the 11 types of hæmolytic streptococci which cause the majority of puerperal cases are also found in infections of the throat and Colebrook and Maxted (1933), after a series of very thorough and painstaking investigations, conclude that in most cases the source of the infection is the throat. It may be the patient's throat, the attendant's throat or the throat of some other person with whom the mother came in contact. The organisms may be lurking about in a handkerchief, a mattress, a not-properly-sterilized wash-hand bowl and similar articles with which the mother comes in contact directly or indirectly during labour. As a matter of fact any infection in the house, e.g., otitis media, erysipelas, nasal sinus infection, whitlow or even a trivial infection of a finger, impetigo, etc., are very real sources of danger. The possibility of puerperal sepsis arising by streptococci from the throat, through the blood stream, has practically been ruled out. The microbe is transferred by some external route.

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## PUERPERAL SEPSIS: A REVIEW

By P. C. DUTTA, M.B., F.R.C.S.(E.), D.G.O.  
CAPTAIN, I.M.S.

Civil Surgeon, Jullundur

A good deal of work has lately been done by various clinicians and laboratory workers on this subject. Some of the results are very useful while others are of doubtful utility. A summary of our present state of knowledge may help that most useful medical member of society, the general practitioner.

It has been very rightly said by Solomons (1931) that the best treatment of puerperal sepsis is prevention. The first essential to attain this is to maintain the physical condition of the mother, so that she may be able to resist infections. This can best be achieved by proper antenatal care, adequate nutrition and the prevention of anæmia. Secondly, the attendant must be thoroughly conversant with the mechanism of labour. This will restrict meddlesome midwifery to the minimum, no interference will be made before it is really indicated, there will be no unnecessary use of forceps, operations, and so on. The attendant must be able to gauge the powers of the uterus, when and how far it has to be helped and when it has to be soothed. This can only be acquired by thorough training and careful observation of cases throughout labour. Thirdly, the knowledge of the source of infection and methods of prevention. It must be realized that it is the neglect of simple things that cause 80 per cent of puerperal infection.

Without going into unnecessary details and discussions it can safely be stated that in nearly all cases of sepsis the infection is caused by introduction of organisms from outside. They may be introduced by the attendant or by the patient herself. Dora Colebrook (1935) and Griffith (1934) found that the 11 types of hæmolytic streptococci which cause the majority of puerperal cases are also found in infections of the throat and Colebrook and Maxted (1933), after a series of very thorough and painstaking investigations, conclude that in most cases the source of the infection is the throat. It may be the patient's throat, the attendant's throat or the throat of some other person with whom the mother came in contact. The organisms may be lurking about in a handkerchief, a mattress, a not-properly-sterilized wash-hand bowl and similar articles with which the mother comes in contact directly or indirectly during labour. As a matter of fact any infection in the house, e.g., otitis media, erysipelas, nasal sinus infection, whitlow or even a trivial infection of a finger, impetigo, etc., are very real sources of danger. The possibility of puerperal sepsis arising by streptococci from the throat, through the blood stream, has practically been ruled out. The microbe is transferred by some external route.

The practice of ablution with bare hands, after defæcation is, in my opinion, a constant source of danger in obstetric practice, unless the hands are thoroughly washed and disinfected. Certain investigations convinced me that faecal organisms could be grown from the hands, after ordinary washings as is done in a day's work, after 24 hours.

Lately, our attention has been drawn to post abortal and puerperal infection by the gas gangrene bacillus and I have seen occasional cases of this. I do not think it is very uncommon in our country. These infections are nearly always caused by faecal contamination. In Europe and other countries this may reasonably be due to extension of infection from the mother's anus, whereas in this country where the woman washes herself more or less thoroughly after defæcation, they may be introduced from the patient's or from the attendant's hands. Bearing these facts in mind, I would advise that the doctor should take every precaution to avoid contamination of his hands with faecal matter. I leave the method to individual choice and discretion.

#### *I. Prevention of introduction of organisms*

Before the actual confinement is undertaken a thorough investigation must be made if there is infection, specially streptococcal, in the family or outside the family with whom the mother comes in contact, and strict measures must be adopted to avoid these. If any sort of streptococcal infection is present in the house, the mother should be confined in a hospital or nursing home, because the organisms may gain entrance by so many insidious ways that it is practically impossible to prevent in a private house.

In 20 per cent of septic cases, it was found that infection with the same type of organism was present in some member of the family and in another 20 per cent the mother came in contact with someone suffering from streptococcal infection of the same type. Bedding and linen may be infected from the air by droplet infection from some member of the family and it must be realized that the organisms may persist in these articles for some time. Similarly, basins, towels, handkerchiefs of the mother or of the attendants are constant sources of danger.

#### *Hands of the attendant.*

Thorough washing with soap and water is the most important item in the antiseptic technique. They must be thoroughly washed with soap and water and scrubbed with a nail brush. Ordinary yellow household soap is better than refined toilet soaps and soft soaps. Antiseptic soaps, e.g., those incorporating carbolic acid or coal tar products are slightly more bactericidal than ordinary yellow soap.

After washing the hands for two to three minutes and soaking them for three minutes in

perchloride of mercury (1 in 1,000) or lysol (1 in 60), as is usually done, organisms can always be cultivated from the hands and fingers. Colebrook (1936) has shown that washing with ordinary soap and water and then rubbing the hands with dettol cream cleanses the hands more thoroughly of the organisms than any other practicable method known at present.

Cruikshank found that the hands may be reinfected from the air as early as two minutes after washing and disinfection by the ordinary antiseptics. Colebrook demonstrated that this reinfection can be prevented for two to five hours if 10 per cent dettol or 30 per cent dettol cream is rubbed on the hands. He strongly advises this procedure with bare or gloved hands and this should be repeated every two hours.

Dettol has an oily base which sticks on to the surface forming an invisible film, and organisms coming in contact with it are destroyed. The effect lasts from two to five hours.

#### *Masks*

These should be used in all cases if possible. In the hot weather it is better to use a two-piece mask. A strip of old towelling (old towel soaks better) about 2 inches wide and 8 inches or 10 inches long with tapes at either end is tied over the forehead and is very necessary to prevent perspiration dripping from the forehead on to the hands, instruments or perineum. The mask proper is made of a piece of linen 8 to 10 inches by 6 to 8 inches. The central part of this is cut off leaving a margin of about 2 inches on all sides. A six-fold piece of gauze is sewn in to fill up the gap. This will keep the face fairly comfortable even in the hot weather.

#### *Gloves*

They must be thoroughly sterilized. The outer side of the glove must not be contaminated when putting them on and every doctor and medical student should learn how to put on a pair of gloves without 'mauling' them. When the gloves are put on, the fingers should be adjusted with a sterile piece of gauze. Smearing them with 10 per cent dettol or 30 per cent dettol cream will prevent reinfection from the air.

#### *Basins and utensils*

They must be thoroughly disinfected either by boiling, burning spirit in them, or scouring them with some strong antiseptic, e.g., a few drops of 10 per cent lysol, pure dettol, etc.

#### *Water for confinement*

If cold sterile water is not available, cyllin one drachm in three pints of water, will sterilize it for the purpose.

#### *Patient's hands*

In about 4 per cent of normal women, Colebrook (1936) was able to grow the same type of

organisms from the mother's hands as are usually responsible for puerperal infection. It is almost unbelievable how often the woman in labour pain will put her hands in this so-closely-guarded spot. Therefore, the patient's hands should also be thoroughly scrubbed and washed and rubbed with dettol.

#### *Preparation of vulva and perineum*

Vulva and perineum are cleaned with soap and water and painted with an antiseptic, e.g., methylene blue or crystal violet. Colebrook recommends 30 per cent dettol cream and has reported very good results by using this.

#### *Vaginal examination*

Unnecessary examinations must be avoided. In a normal case no interference should be made with the vagina and it should not be painted with any antiseptic.

When vaginal examination has to be made, the vulva should be thoroughly rubbed with some antiseptic such as crystal violet, methylene blue or 30 per cent dettol cream. In making a vaginal examination the vulva should be widely separated with the left hand so that no organisms are pushed into the vagina from outside. The vaginal examination must be done at least five minutes after painting the part with the antiseptic. When an examination is made, it must be done thoroughly and the attendant should not bring out the fingers until he is satisfied. Repeated withdrawal and introduction of the fingers will only help infection. The disinfectant should be re-applied every three hours and before any internal manipulation.

#### *Douching the uterus after operative delivery*

An extract from the final report of the departmental committee on maternal mortality and morbidity is here quoted: 'It is practically certain that antiseptics will fail to kill pathogenic bacteria at the termination of labour when the whole genital tract is bathed in blood and serum. Firstly, because the microbes at the time if not already in the tissues are to a large extent caught up in the meshes of the blood clot, and no antiseptic can diffuse into the blood clot in a concentration sufficient to kill microbes unless it is present for a long period in a very high concentration—a condition which cannot be maintained in the genital tract because of the constant outward stream from the placental site. Secondly, antiseptics will fail in these circumstances because all of them when brought into contact with undiluted blood and naked fixed tissue cells such as those of the placental site will combine in great mass and in so doing will forfeit their power to combine with and kill the relatively negligible mass of microbes. Not only will the antiseptics fail in these circumstances but they will probably often do harm. For it has been clearly shown that in contact with the blood most of the antiseptics

destroy the leucocytes upon which the bactericidal efficiency of the blood chiefly depends. There can be little doubt that the mother's best chance of escaping infection lies in the imprisonment of the microbes in the blood clot and their destruction here by the agency of the leucocytes'.

#### *II. Prophylactic treatment of sepsis*

Maintaining the mother's health in perfect condition in the antenatal period, as has already been stated, is of supreme importance. This has to be done with adequate dietary. When the diet is deficient, proprietary preparations should be used to prevent anaemia and vitamin deficiency. In India where the average doctor has to work under conditions far from ideal, he must improve this, his first line of defence. For this purpose some concentrated preparation of vitamin A is most useful.

Green-Armytage and Dutta (1932) years ago recommended small doses of quinine in the last few months of pregnancy. This is now advocated by many other authorities. It is doubly useful in this country. It not only increases the resistance of the patient but will keep the old malarial infection, from which most people suffer, at bay, during the puerperium. It is a common experience in this country that old malaria often flares up at the puerperium. Moreover small doses of quinine will improve the tone of the uterine muscle and ensure efficient contraction during labour. This in its turn will lead to less interference, less incidence of forceps delivery and consequently less chance of sepsis. Primary uterine inertia due to flabbiness of the uterus is so common in this country that it is a real help. Even after a normal delivery it is very wise to put the woman on a mixture containing ergot and quinine for a few days to ensure a well-contracted uterus and to stop the old malaria.

Thompson (1935) recommends  $\frac{1}{2}$  gr. doses of calcium sulphide thrice daily as a routine from the day of admission or preferably from the prenatal period. It is given in a capsule with halibut oil. The treatment is cheap and efficient.

#### *Antistreptococcal serum*

Cameron and Thompson (1931) obtained very good results with this, but lately they have reported far better results with halibut oil and calcium sulphide.

Solomons (1935) during the tenure of his mastership of Rotunda Hospital used 20 c.cm. of antistreptococcal serum as a routine prophylactic in all difficult cases and reported greatly improved results. He uses it after all operative deliveries except low forceps.

Colebrook (1934) is of opinion that the prophylactic action of serum is doubtful, and, on the analogy of experimental animals, states that the serum may interfere with the ability of the patient to deal with infections in a

previously sensitized patient, and as such may be positively harmful.

*Iodine.*—In a previous paper I (Dutta, 1929) remarked that iodine given as a prophylactic was found useful. I have used ordinary aqueous solution of iodine with potassium iodide intravenously for the purpose and confirm my previous observations. Moreover, this drug being very cheap and always available in every dispensary is within everybody's reach. For curative purposes, I do not think it to be of much use.

*Prontosil.*—This has been used for prophylactic purposes with good results.

As noted above quinine and ergot should be given in all cases for the first eight days. It does not matter what preparations are used so long as they are effective.

Many other antiseptics have been recommended from time to time but they have not stood the test of time.

### III. Treatment of puerperal sepsis

The modern treatment of puerperal sepsis is to increase the resistance of the patient.

Mild cases get well with postural drainage, hot fomentations to the abdomen, ergot, quinine and possibly 20 c.cm. of antistreptococcal serum combined with fresh air and good sleep. Digital exploration should never be done unless a piece of placenta has been left behind.

*Remington Hobb's treatment.*—This consists of intra-uterine injection of sterile glycerine. It has been recommended that the injection should be done three times a day through a special catheter kept in the uterus. This may be possible in a special hospital where trained assistants are available. In the average district hospital or private practice it is not possible and I recommend injection of 20 c.cm. glycerine once a day. This method of treatment is specially useful if the lochia has stopped. A speculum is passed, the cervix is cleaned and 20 c.cm. of glycerine is injected through an ordinary female catheter passed into the uterus.

Intramuscular injection of 5 grains of quinine every other day has also been recommended.

If the blood shows a poor leucocytic response injections of sodium nucleate may be good.

#### *Prontosil*

It is a chemotherapeutic agent for streptococcal infection and very encouraging results have been reported by certain German observers. This has recently been confirmed by Colebrook (1936). I used it in 15 bad and moderately severe cases: there were no deaths.

One ampoule is injected intramuscularly two to three times a day. At the same time one to two tablets or more are given three times a day. The tablets are chewed after meals with plenty of water. The amount given by injection may have to be increased to 60 to 90 c.cm and may

have to be repeated depending on the seriousness of the illness and condition of the patient. Generally not more than 20 c.cm. are required each day combined with oral administration as indicated above.

When the fever subsides and general condition improves, treatment may be continued with tablets alone.

The occasional occurrence of reddish urine following the administration of prontosil is due to the excreted dye-stuff and has no pathological significance.

#### *Blood transfusion*

Of all the life-saving methods of treatment that have been introduced in medicine in the last few years, blood transfusion stands out pre-eminent. Even in obstetric practice it has proved so valuable that we thought it advisable to include a detailed description of the technique in the latest edition of the textbook of midwifery with which my name is associated. It is exceptionally useful in severe puerperal septicæmia, specially those cases associated with anæmia. Even a small quantity of blood (100 c.c.) will produce a splendid effect. Not more than one pint need be given at a time, but it has to be repeated as often as is necessary.

Blood transfusion is not a difficult operation and, in my opinion (Dutta, 1936), can be carried out even in a rural dispensary and without any special instrument, particularly if small quantities are required. In a town where assistants are always available it can easily be carried out in private practice. Only one thing one has to be certain of and that is, being able to test the compatibility of the bloods. This is easy for one who has seen blood grouping done by a competent person.

#### *Operative treatment*

It is beyond the scope of this paper to enter into detailed description of different surgical procedures and their indications. It should however be remembered that draining the pouch of Douglas by posterior colpotomy is very useful when there is a collection of fluid in the pouch; also that a pelvic abscess should be opened just above the inguinal ligament.

In a serious case, an operation like hysterectomy or ligature of the ovarian vein will kill the patient, whereas mild cases will recover without any operation. Hysterectomy is only indicated in cases of abscess in the wall of the uterus, sloughing fibroid and ruptured septic uterus.

### IV. Post-abortion and puerperal gas gangrene

Special mention of the above infection is necessary. The infection, as I have already stated, is not very uncommon and with better knowledge and more thorough bacteriological diagnoses it may be possible to find out the frequency of the infection in this country. Recently Hill (1936) reported 30 cases occurring in one hospital within two years, so it

appears that it is far more common than we think it to be.

*Source of infection.*—This is generally from the rectum. Faecal contamination is very liable to occur after an enema. In post-abortion cases, criminal abortion is a fruitful cause.

The organisms can be grown from the hands of medical attendants after washing and drying, less often after thorough scrubbing, and in some instances after thorough scrubbing and putting on wet sterilized gloves (Hill). That is why I have particularly mentioned the avoidance of faecal contamination of the hands, thorough scrubbing and putting on of the gloves in the right way.

*Symptomatology.*—This may be considered under the following headings :—

- (i) General and local signs of sepsis.
- (ii) Jaundice, most marked in the face and body, least in the legs. It comes on early, develops rapidly and quickly and is soon followed by—
- (iii) Cyanosis, specially of the fingers and toes. Absence of cyanosis is a good omen.
- (iv) Pulse rises quickly to about 140, is of low tension, soft and running. Signs of peripheral circulatory failure are present.
- (v) Temperature varies between 100 and 102.
- (vi) Urine is very small in quantity, and a sample may have to be obtained by catheter for examination. It is of port-wine colour, containing hæmoglobin, methæmoglobin and red-blood cells debris. Albumen is always present. The disease practically always ends in renal failure.
- (vii) Blood serum is of Burgundy colour due to hæmolysis.
- (viii) Within a few days the skin becomes very dark and the conjunctiva may assume a chocolate colour.
- (ix) The placenta is dirty pinkish-grey colour, soft, friable and spongy. The syndrome develops with amazing speed. It may be retarded or modified, but is only exceptionally arrested by therapy.

*Diagnosis.*—It is very difficult to diagnose puerperal cases early. The symptomatology is not evident till the very end, and, as it is often associated with a dead child or toxæmia, it is further obscured.

Jaundice, increasing pulse rate out of proportion to an evident pathological lesion, sudden collapse, increasing pain of the uterine muscle may indicate the lesion.

In severe and late cases gas crepitus of the lower abdomen may be evident.

*Treatment.*—Prophylactic—20,000 to 40,000 international units of gas gangrene serum.

Curative—total hysterectomy in early cases.

Forty thousand units of serum should be given intramuscularly as soon as it is diagnosed and repeated every 12 hours for at least three days. In grave cases a dose of 40,000 to 60,000

(Continued at foot of next column)

## AN APPARATUS FOR THE DISTRIBUTION OF ANTIGEN EMULSION IN THE KAHN TEST

By N. SESHADRINATHAN

and

B. TIMOTHY

(King Institute of Preventive Medicine, Guindy)

For testing every sample of blood the Kahn antigen emulsion has to be distributed in three varying volumes with the Kahn pipette. When a number of tests have to be performed, the time, labour and eye-strain involved in carefully transferring the antigen emulsion to the bottom of each tube are factors which require to be considered.

The Kahn antigen emulsion does not remain homogeneous; when kept for more than a minute or two, the particles settle down unless the emulsion is constantly stirred up.

Donald's drop method used in the Wassermann test was found unsuitable for the Kahn test. The particles in the emulsion separated out and clogged the fine end of the delivery tube. An ordinary Wright's pipette with the tapering end calibrated to deliver 0.125 c.cm. per drop and with which small volumes of antigen could be taken at a time was found

(Continued from previous column)

units has to be given intravenously and repeated daily for two or three days.

To prevent renal failure glucose and calcium gluconate should be given intravenously with normal saline.

Blood transfusion is indispensable for saving the patient with hæmolysis.

Plenty of fluids with alkalies should be given by the mouth.

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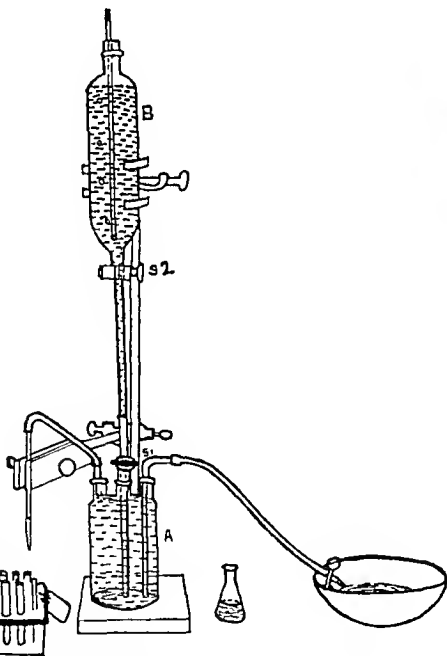


unsatisfactory. The emulsion, being heavy, flowed down too rapidly and the rate of dropping was not easily controlled. To overcome this, a bend was made just above the delivery end to give the pipette the shape of a bayonet. This bend produced a throttling effect on the flow of the antigen emulsion. With such a pipette, which was good enough for a small number of bloods, and ensured speedy distribution of the antigen emulsion, the rate of flow of the drops was not always uniform, especially towards the end of a series of tests when the finger muscles were naturally fatigued. It was, therefore, thought that a mechanical device for dropping the emulsion would be good.

An apparatus, the details of which are given below, was devised for this purpose. By means of this the antigen emulsion could be sucked up into a pipette in small quantities at a time and delivered in regulated drops by means of hydrostatic pressure. (For this suggestion we are thankful to Mr. Sukumaran, Lecturer in Electrical Engineering, Engineering College, Guindy.)

The apparatus consists of :

(1) A Woulfe's bottle with three necks and ground-in stoppers. The side necks have one delivery outlet and one syphon tube attached respectively (marked A in the diagram).



An apparatus for the distribution of antigen emulsion in the Kahn test.

(2) A separating funnel fitted with two stop-cocks one below the other and passing through the central neck of the Woulfe's bottle. The mouth of the separating funnel is fitted with a rubber stopper through which a Marriot's tube is passed (marked B in the diagram).

The apparatus is fitted as in figure. Care should be taken to see that all connections and stoppers are quite airtight. The Woulfe's bottle

and the separating funnel are filled with tap water. The delivery pipette, which is drawn out to deliver 0.125 c.cm. of antigen emulsion per drop (the outer diameter of the end to fit into no. 54 Starret's drill and wire gauge), is attached to the delivery tube of the Woulfe's bottle by a short length of rubber tubing. The pipette is held vertically in position by a wooden clamp as shown in the figure, just high enough to allow the racks of tubes to pass under to receive the drops of emulsion. The syphon arrangement is fitted as in the figure. To set the syphon into action, close the delivery end of the bottle, open both stop cocks ( $S_1$  and  $S_2$ ) and press the pinch cock at the end of the syphon tube. This drives the water in the bottle to fill up the syphon tube and set it working. On releasing the pinch cock, the syphon remains closed.

The antigen emulsion having been prepared in the usual way, is sucked up into the pipette (about 1 c.cm. at a time) as follows :—

The vial containing the antigen emulsion is brought under the pipette so that the tip of the latter dips into the emulsion. The syphon is released by pressing the pinch cock and the antigen emulsion will rise up in the pipette. When sufficient amount has been sucked up, the pinch cock is released. The fluid remains held up in the pipette.

The lower stop cock of the separating funnel ( $S_1$  in figure) is now opened fully. By adjusting the upper stop cock ( $S_2$  in figure) the flow can be regulated to obtain the proper speed of dropping of the antigen emulsion, slow enough to receive the drops into the tubes without spilling out. Having adjusted this, the lower stop cock is closed. The racks holding the test tubes are now held under the delivering pipette, the lower stop cock  $S_1$  is opened, and the racks moved slowly to bring the tubes one after another under the pipette to receive the drops. Into the first row one drop is delivered. Into the second row two drops, into the third row four drops. When the charge of antigen in the pipette is finished, it may be recharged as described above.

Certain precautions are to be observed in the working of the apparatus. All connections should be airtight. The Woulfe's bottle should be completely filled with water and the air space that occurs in the bottle by working the syphon should be kept reduced to a minimum. The stem of the separating funnel should be completely filled with water. To the water in the apparatus, some antiseptic may be added to prevent the growth of algae, for only very small quantities of water are wasted whenever the apparatus is worked, and the water need not be replenished for some weeks.

The apparatus is very simple, accurate and labour saving. It can be fitted up in any laboratory and requires very little practice to work.

## THE RARITY OF THE MALE *ENTEROBIUS VERMICULARIS*

By P. V. GHARPURE, M.D., D.T.M. & H.  
Professor of Pathology, Grant Medical College  
and

V. V. GHARPURE, M.B.B.S., B.H.Y.  
(From the Pathology School, Grant Medical College)

IN the progress of an investigation we were struck by the frequency with which we encountered male threadworms; this tempts us to write this short note. Many books mention that the male threadworms are 'rare', are 'infrequently found', are 'fewer', etc., clearly indicating that they are rarely seen. Our investigations have been confined to the vermiform appendix. We are publishing separately our findings in respect of different aspects of the condition of the vermiform appendix.

The material for investigation came from two sources:—

- (1) From the operation theatre.
- (2) From the post-mortem room.

The frequency of male threadworms has been noted.

The technique followed is as follows:—

As soon as the body is opened the appendix is lifted by gently holding its tip, the mesentery is separated, and a tight ligature tied round its broad receding base. It is then received in a Petri dish. It is slit open along the mesenteric attachment. The contents are carefully viewed. The female threadworms are a contrast to the males in every respect—they are straight with sharp-pointed extremities, opaque white and comparatively rigid. These give the clue to the material being useful for investigation. Small particles of faecal contents are then carefully emulsified in clear saline and tiny transparent hooked small mucinous objects are picked up by sucking fluid by pipettes. These invariably turn out to be male threadworms. We have not failed so far in finding males in any specimen. The numbers in some have been large. In one appendix we found over 12 males in only part of the contents. In that case the bowel contents had shown 36 females. We have not investigated in the same manner stools or intestinal contents from post mortems. It is our impression that the characters of the threadworm are probably more responsible for the reported rarity. They are very tiny, transparent, and often embedded in faeces. In one appendix we found three males coiled together in one faecal clump of the size of a loopful. The male worms are further very fragile.

We are venturing to publish this note in order that other workers in the post-mortem room may confirm our observations.

## SERUM COMPLEMENT IN RELATION TO VITAMIN-C DEFICIENCY IN GUINEA-PIGS

By R. K. CHAKRABORTY, M.Sc.

Lady Tata Memorial Scholar  
(Indian Institute for Medical Research, Calcutta)

MARSH (1936) observed that the complement titration values of the serum of guinea-pigs decreased very considerably when vitamin C was withdrawn from the food of the animals. When diets rich in vitamin C were supplied to them, the concentrations of the complement in the serum came up to the original values and sometimes even higher. Marsh concluded that vitamin-C deficiency causes a marked fall in the concentration of serum complement.

It seemed to us of interest to investigate this serological problem further in relation to the studies on the biochemical function of vitamin C with which we are engaged. After this work had been completed, a paper by Zilva (1936) appeared in which he was unable to confirm the results of Marsh. Our experiments were planned somewhat differently. It was observed by Gulha and Ghosh (1935) that the guinea-pig embryo in the early stages of its development could apparently synthesize vitamin C, an observation which was in accord with the findings of Bourne (1935) that pregnant guinea-pigs get scurvy more slowly than non-pregnant guinea-pigs, when they are placed on a scorbutic diet. Accordingly, we wished to study the changes of serum complement, if any, in vitamin-C deficiency in relation to sex and to the state of pregnancy. Thus, three groups of guinea-pigs consisting of male, female (non-pregnant) and female (pregnant) were chosen. The titration values of the complement of the guinea-pigs were obtained when the animals were on normal diet (gram and green grass). Then each guinea-pig was fed on a scorbutic diet containing 80 per cent gram and 20 per cent oats for a period of 12 days and 2 mg. of pure ascorbic acid were fed daily during this period and then their complement values were determined. The animals were then placed on the scorbutic diet alone for a period of 20 days and the complement titration values of each guinea-pig were determined on the 12th and 20th days, after their being put on this scorbutic diet.

Before proceeding with the titration of the complement, the hæmolysin unit was first determined every day and two units of hæmolysin were used in the titrations of the complement. The serum of the guinea-pigs, for the complement estimation, was made into different dilutions such as 1/4, 1/6, 1/8, 1/10, etc., up to 1/40 and 0.3 c.cm. from each dilution was taken at the time of experiment.

In these titrations the hæmolytic system in each tube consisted of:—

- (a) Red blood cells (sheep's)—0.5 c.cm. of 2 per cent suspension.



(b) Hæmolysin used—0.5 c.cm. of two units.  
(c) Serum (of which the complement was to be determined)—0.3 c.cm. of different dilutions.

One c.cm. of normal saline was added to each of the tubes so that the final volume in each case was 2.3 c.cm. The tubes were then incubated on a water bath at a temperature of 37°C. for half an hour and the values were noted. Control experiments were made side by side with (1) sheep's cells *plus* hæmolysin, (2) sheep's cells *plus* saline and (3) sheep's cells *plus* complement but no hæmolysis occurred in these control tubes.

The following table shows the dilutions of the serum where complete hæmolysis took place when the guinea-pigs were kept on different diets :—

Serial number	(a)	(b)	(c)	(d)
	When the animals were on normal diet	After 12 days feeding of 2 mg. of ascorbic acid <i>plus</i> vitamin-C deficient diet	After 12 days on vitamin-C deficient diet	After 20 days on vitamin-C deficient diet
<i>Male guinea-pigs</i>				
1	1/10	1/10	1/10	dead
2	1/20	1/20	1/16	1/16
3	1/8	1/8	1/8	dead
4	1/20	1/20	1/20	1/20
5	1/20	1/20	1/20	1/16
6	1/20	1/20	1/20	1/20
<i>Female (pregnant)</i>				
1	1/16	1/16	1/16	1/16
2	1/10	1/10	1/10	1/10
3	1/8	1/8	1/8	1/8
4	1/8	1/8	1/8	1/8
5	1/16	1/16	dead	dead
6	1/5	1/5	dead	dead
<i>Female (non-pregnant)</i>				
1	1/8	1/10	1/8	1/8
2	1/10	1/10	1/10	1/10
3	1/10	1/10	1/10	1/10
4	1/10	1/10	1/10	1/8
5	1/8	1/10	dead	dead
6	1/5	1/5	dead	dead

The results indicate that in each batch of six guinea-pigs, there is a slight reduction of complement only in two cases among the males, only in one case among the non-pregnant females and in no case among the pregnant females. It appears, therefore, that in vitamin-C deficiency the serum of guinea-pigs hardly suffers a reduction of the complement; nor is there any material sex-difference in this respect.

My thanks are due to Drs. B. C. Guha, J. C. Ray and H. Ghosh for advice and help.

(Continued at foot of next column)

## THE PROTEIN AND MINERAL VALUES OF SOME COOKED BENGALI DIETS

By J. C. PAL, M.Sc.

and

B. C. GUHA, Ph.D., D.Sc.

(Indian Institute for Medical Research, Calcutta, and University College of Science, Calcutta)

DURING recent years much attention has been concentrated on the nutritional level of large communities and on the nutritive values of diets consumed by them. Work has chiefly proceeded on three lines—(1) the measurement of the physical indices of the nutritional conditions of the people, (2) the measurement of the prevalence of deficiency diseases, and (3) the estimation of the food values (mainly protein, mineral and vitamin values) of the diets as indicated by their daily or monthly purchases of raw food materials. The deficiencies so ascertained have been sought to be remedied by incorporating in the diets foodstuffs, whose nutritive values, again, have usually been determined in the raw state. Sir John Orr (1936), for instance, has recently published an instructive monograph in which the consumption of essential food ingredients by sections of the British people has been computed from a survey of their budgets concerning the purchase of raw foodstuffs. It would appear that, while such estimates are very useful, more precise and practical information would be obtained if the actual cooked diets, as they are consumed, are evaluated with regard to their nutritive values. Cooking would doubtless alter the food values considerably.

Sir Robert McCarrison's pioneering work in this direction concerning the growth-promoting values of diets consumed in different provinces in India, as determined by the growth of rats, first drew attention to the defects of some of these diets. Guha's results (1934), obtained with the cooked diets obtained from a middle-class young men's hostel in Calcutta, also pointed to partial vitamin-A and -B deficiency in these diets. In this connection, it should be mentioned that, recently, results obtained with experimental animals have, with a certain degree of justification, been criticized with regard to their applicability to the human. On the other hand, it should be realized that metabolic experiments on the human, unless they are carried out with a reasonably large number of subjects, which it is difficult to do for obvious reasons, are apt to be very misleading, owing to the great individual variations

(Continued from previous column)

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between man and man. With experimental animals, however, a large number of experiments can be carried out and the results are comparable among themselves. Both methods are open to criticism, but the more reliable method would seem to be to use experimental animals and then to check the results with human subjects. Thus, the value of milk as an article of diet has long been established with experimental animals and Corry Mann's extensive experiments (1926) on the feeding of milk to the young people in educational institutions in Great Britain have confirmed this idea.

In the present work we investigated the protein, calcium, phosphorus and iron contents of the cooked diets consumed in (1) seven middle-class Bengali families in Calcutta, (2) two hospitals and (3) two students' hostels attached to Colleges, in order to obtain information about the intake of these essential dietary constituents in average families, hospitals and hostels. Although it is generally recognized that the diet of the Bengalis is relatively poor in protein and perhaps also in some minerals, precise analytical data concerning the cooked diets are lacking. The present paper is in the nature of a preliminary report and more extensive investigations are in progress.

#### EXPERIMENTAL

The different items of the cooked diet were taken in the proportions of rice 100 g., dāl (aqueous decoction of pulses) 25 g., fish curry 15 g. and vegetable curry 20 g. These are the proportions in which these items are taken by middle-class people in Bengal. These were mixed up intimately in a dish; aliquot portions (3 to 5 g.) of this mixture were taken for protein estimation and the remainder was dried in an air oven at 100° to 105°C.

The protein content was estimated by the usual Kjeldahl's method of estimating nitrogen and by multiplying this value by the factor 6.25.

For the estimation of iron, calcium and phosphorus, the above dried diet mixture was ignited in a silica crucible and turned to ash completely. The ash was taken up in dilute hydrochloric acid and any insoluble residue was filtered off. The filtrate was made up to a known volume.

Aliquots of this solution were used for the determination of iron, calcium and phosphorus.

*Estimation of iron.*—Iron determination was carried out by the method of Elvehjem (1930). Ten c.cm. of the above solution were taken, made distinctly alkaline with 40 per cent sodium hydroxide (iron-free), and boiled for an hour. This was cooled, made acid with dilute hydrochloric acid and diluted to a volume of 50 c.cm. The colorimetric estimation was then carried out as outlined by Kennedy (1927). One c.cm. of the standard iron solution equivalent to 0.1 mg. of iron was mixed with 5 c.cm. dilute hydrochloric acid and diluted to 50 c.cm. Aliquot portions (10 c.cm.) of the standard and of the unknown were placed in stoppered cylinders, 10 c.cm. of amyl alcohol and 5 c.cm. of 20 per cent

potassium thiocyanate were added in each cylinder and the mixture was thoroughly shaken. The coloured layers of amyl alcohol were then compared in a colorimeter.

*Estimation of calcium.*—A known volume of the ash solution was made just alkaline with ammonia, excess of 20 per cent ammonium acetate (10 c.cm. to 15 c.cm.) was added to it and the solution was freed from phosphates by means of dilute ferric chloride. This was filtered and washed with 1 per cent ammonium acetate. The filtrate and washings were boiled with 2 to 3 g. ammonium chloride. One to 2 g. of oxalic acid crystals were added to the boiling solution with continual stirring, a few drops of strong ammonia and a sufficient quantity of 3.5 per cent ammonium oxalate solution were added while the stirring was continued. The precipitate of calcium oxalate was filtered, washed free from chloride with 1 per cent ammonium oxalate solution and burnt to calcium oxide in a silica crucible. The above method was adopted from that of Richards, McCaffrey and Bisbee (1901). The calcium was calculated as calcium oxide.

*Estimation of phosphorus.*—The method adopted was that of Burns and Henderson (1935). An aliquot portion of the ash solution was taken; 5 c.cm. to 10 c.cm. of concentrated nitric acid were added to it, which was followed by 20 c.cm. to 30 c.cm. of 34 per cent ammonium nitrate solution and finally 70 c.cm. to 80 c.cm. of 3 per cent ammonium molybdate solution were added. The solution was heated and the precipitate of ammonium phosphomolybdate allowed to settle. The precipitate was filtered and freed from acid by washing with hot water. The precipitate was then dissolved in a known volume of 0.5 N sodium hydroxide solution and the excess of alkali titrated with 0.5 N hydrochloric acid, phenolphthalein serving as indicator. One c.cm. of 0.5 N sodium hydroxide was equivalent to 0.675 mg. of phosphorus.

In the two principal meals, Bengalis generally take the same diet and in this work it was assumed that they take the same quantity also. The Bengali middle-class adult was thus supposed to take 1,480 g. in the two principal meals (Guha, 1934). The total quantities of iron, calcium, phosphorus and protein were calculated as they were present in this total quantity of 1,480 g.

The refreshments, tea, milk, etc., taken in addition to the principal meals, were not taken into account.

The quantities of iron, calcium, phosphorus and protein consumed per day by an adult are given in the table.

#### Discussion

The figures given in the table show that the consumption of these dietary constituents by an average adult per day is comparable among the middle-class families, hospitals and hostels in Calcutta. Stiebeling (1933) of the Government Bureau of Home Economics, U. S. A., gives standard figures for consumption per head per day as follows: protein 68 g.; calcium oxide 1.21 g.; phosphorus 1.23 g.; iron 13 to 14 mg. Comparing the mean values of the family, hospital and hostel diets obtained in the present set of experiments, viz, protein 56.26 g.; calcium oxide 0.89 g.; phosphorus 1.10 g.; iron 55.6 mg.; it would appear that, so far as the present figures go, the consumption of iron is more than optimum, while the consumption of calcium is

TABLE

Family number	Days	Iron in mg.		Calcium oxide in g.		Phosphorus in g.		Protein in g.	
		Mean value		Mean value		Mean value		Mean value	
1	1	28.12	60.83	0.71	0.65	0.82	0.86	60.38	58.73
	2	116.77		0.36		0.71		51.99	
	3	36.85		0.84		1.07		63.83	
2	1	48.16	92.64	0.87	0.67	2.09	2.13	55.50	55.50
	2	137.19		0.48		2.18		55.50	
3	1	43.07	47.57	1.19	0.90	1.22	1.31	47.51	51.01
	2	37.74		1.08		1.54		55.35	
	3	61.91		0.45		1.18		50.17	
4	1	23.12	18.41	1.31	0.87	1.33	1.12	46.47	56.71
	2	15.54		0.16		1.03		55.35	
	3	16.58		1.14		1.02		68.31	
5	1	49.88	58.66	1.52	1.24	1.59	1.53	50.91	51.60
	2	54.32		0.41		1.66		54.91	
	3	71.78		1.81		1.35		48.99	
6	1	50.62	50.94	1.52	1.15	0.85	0.89	47.06	49.28
	2	44.10		0.40		0.81		49.58	
	3	58.12		1.54		1.01		51.21	
7	1	81.55	66.98	1.87	1.22	1.17	1.03	55.94	51.33
	2	63.30		0.35		0.87		53.35	
	3	56.09		0.47		1.07		44.70	
Mean value of all the families.		56.57		0.95		1.26		53.45	
Hospital number	Days								
1	1	69.76	66.63	0.54	0.77	1.08	1.10	63.21	61.33
	2	63.48		1.01		1.13		59.45	
2	1	53.26	50.45	0.98	0.95	0.88	1.07	55.65	55.12
	2	48.99		1.21		1.11		48.78	
	3	49.12		0.67		1.23		60.93	
Mean value of the hospital diets.		58.54		0.86		1.08		58.15	
Hostel number	Days								
1	1	43.00	39.44	0.71	0.79	1.13	0.97	57.65	56.08
	2	39.35		0.54		0.93		61.34	
	3	35.98		1.13		0.87		49.27	
2	1	54.39	63.97	1.18	0.98	1.03	0.99	56.38	58.30
	2	63.15		0.78		0.91		51.16	
	3	74.39		0.99		1.03		67.38	
Mean value of the hostel diets.		51.70		0.88		0.98		57.19	
Mean value of the family, hospital and hostel diets.		55.60		0.89		1.10		56.26	

about 25 per cent lower and of phosphorus slightly lower. The consumption of protein is also lower and, when it is considered that the bulk of the protein again is derived from vegetable sources, a deficiency in the consumption of adequate amounts of protein of high biological value is indicated. It should be stated that though the consumption of iron appears to be high, it is not clear what proportion of this is present in the assimilable form. It should, however, be remembered in this connection that Stiebeling's standards might quite conceivably be inapplicable to India. But, although there has been discussion on the subject, the actual standards applicable to Indian conditions have not yet been worked out.

### Summary

Analyses have been carried out of the cooked diets consumed in seven middle-class families, in two hospitals, and in two hostels in Calcutta. The results are remarkably similar among these three groups. A comparison of

these figures with Stiebeling's standard figures indicates a low consumption of calcium and of protein of good biological value in the present observations. On the other hand, the consumption of iron seems to be higher than the standard value and that of phosphorus only slightly lower.

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## A Mirror of Hospital Practice

### COMBINED MYOPATHY AND NEUROPATHY

By K. D. MANOHAR, M.D. (Bom.)

(From the Pathology School, Grant Medical College, Bombay)

MYOPATHY is not a lesion commonly met with in the post-mortem room. Although a slowly progressive disease beginning in childhood, myopathy hardly permits its victim to reach such an advanced age as to develop neuropathic lesions of a vascular nature such as were found in the case studied which is the first noted in the pathology school, Grant Medical College, since 1920.

A male, aged 45, was brought to the hospital, emaciated, unconscious and with spasm of the right side of the body. No history could be obtained. The head was asymmetrical, the left side of the chest, arm and forearm were shrunken and there was an old fracture deformity of radius and ulna. The hand was in a good state of nutrition, there being no atrophic changes.

The right lower limb was 10 cm. shorter than the left, and the calf was 4 cm. less in diameter. The blood vessels were thickened and tortuous; blood pressure was 148 systolic and 96 diastolic. Ophthalmoscopy showed retinal hæmorrhages and choked disc on the right side. The patient died without regaining consciousness.

*Post mortem.*—The skin of the left upper limb was thinned and parchment-like. Well-marked arcus senilis was present. The blood vessels in the limbs were thickened but not blocked at any part of their course.

The kidneys were granular, red and small. The cut surface showed excess of pelvic fat and narrowed cortex and medulla, and a number of fibrous bands were present.

Heart moderately hypertrophied, the left ventricle showing distinct hypertrophy as well as dilatation. Coronary vessels patent; musculature normal. The whole length of the aorta showed extensive and severe atheroma with plaques of calcification and soft vegetations.

The skull cap was asymmetrical and thickened, the left half being 5 cm. less in circumference than the right, and excess of fluid escaped on opening the dura mater. A bony plate projected into the cranial cavity from the left orbital roof, forming an empty cyst 7 cm. in depth and 3 cm. in height. This space did not communicate with the frontal sinus or the orbit. The left cerebral hemisphere was atrophied and covered with thick and opaque pia-arachnoid. The blood vessels were thin but not obviously obliterated.

The right internal carotid artery showed obvious calcification of the coat and narrowing of the lumen. Extensive recent hæmorrhage had ploughed up the basal ganglia and the capsular region.

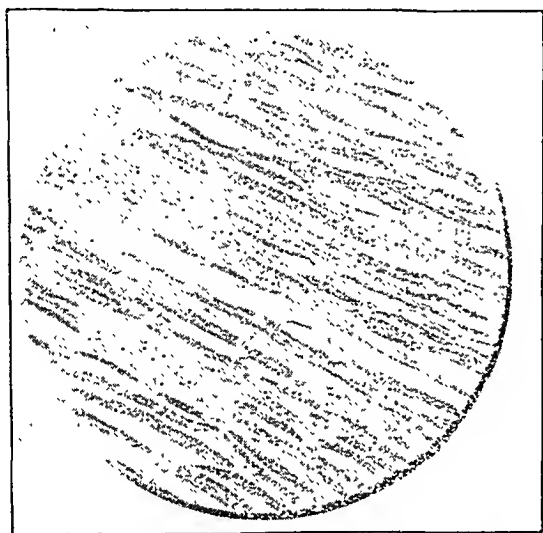
The spinal cord, brain stem and cerebellum showed no gross abnormality.

In the face, the orbicularis oculi and oris were dull white in colour but not distinctly yellow nor greasy to the feel. The extrinsic muscles of the eye and the other muscles of the face and tongue were normal. The muscles of the neck were normal, except the trapezius and the sternomastoids. The muscles of the trunk and diaphragm were normal. In the lower limbs there was a fatty mottling of all muscles on the right side, but this mottling was distinct in appearance from the uniform dull white colour of the affected muscles in the upper limbs. The muscles of the right lower limb were also distinctly more greasy than the muscles in the upper limbs or other healthy muscles of the body.

The muscles of the left upper limb had undergone a marked atrophy. The pectorals, rhomboids and serratus anterior could be well defined, but were much smaller than those of the right side and were dull white in colour. The trapezius showed a number of healthy deep brown muscle bundles interspersed with dull white fibres. In the arm only the belly of the biceps had

persisted as a well-defined muscle but it was of dull white colour. All the muscles of the forearm were completely atrophied, but the intrinsic muscles of the hand were well preserved.

The atrophy was less marked on the right side. Some muscles showed healthy fibres alternating with degenerated fibres and all the muscles were well defined. The trapezius, levator scapulae, and serratus anterior had undergone complete degeneration while the latissimus dorsi, rhomboids, supraspinatus and infraspinatus showed partial degeneration. The teres major and minor were healthy and the subscapularis were completely degenerated. The coracobrachialis and triceps showed complete degeneration; the deltoid, biceps and brachialis anterior showed partial degeneration. In the forearm, pronator teres and quadratus, flexor carpi radialis, palmaris longus, brachioradialis, and anconeus had undergone complete degeneration, and the other muscles were normal. In the palm, flexor pollicis brevis, adductor pollicis and short flexor and extensor of the little finger had degenerated, the other short muscles were healthy.



Photomicrograph showing fragmentation of muscle bundles and cellular invasion of sarcolemma.

Histological examination of the muscles showed pale, homogeneous, stained fibres alternating with very large, deeply-stained bundles. The fibrous sheath was prominent and there was a distinct multiplication of nuclei as well as mononuclear and giant-cell infiltration. The more degenerated muscles showed fibrous tissue replacement but fatty vacuolation was not prominent.

Creatine estimation was carried out; the control healthy muscle showed a creatine percentage of 150 mgm. per cent, and the muscles from this case failed to show more than a trace of creatine.

Direct staining for creatine was done by immersing pieces of normal, neuropathic muscles and portions of muscles from the present case, in solution of picric acid in 10 per cent sodium hydroxide. The normal muscle took on a deep mahogany colour, the neuropathic muscle showed a few healthy muscle bundles which took on a deep colour while the muscle from the present case remained pale yellow.

Thanks are due to Dr. Patwardhan, Professor of Biochemistry, G. S. Medical College, for undertaking the creatine estimation, and to Prof. V. R. Khanolkar, Professor of Pathology and Bacteriology, G. S. Medical College, for supplying histological specimens of biopsy material from myopathic patients.

## MULTIPLE STONES IN THE BLADDER

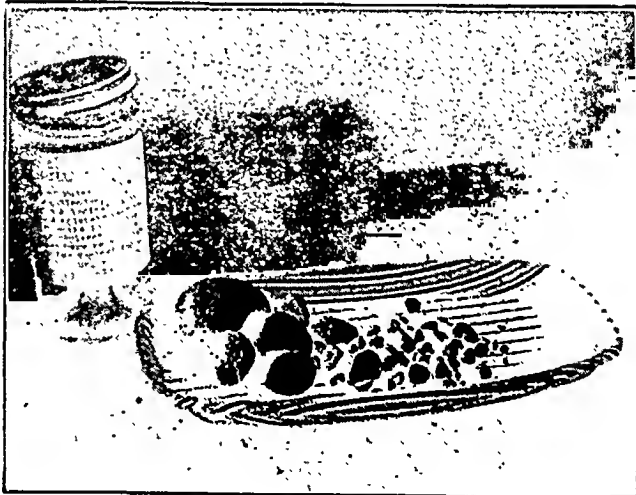
By D. K. FAIRBAIRN KHUSRO, M.R.C.S., L.R.C.P.,  
M.B., Ch.M., L.M.

*Medical Officer in charge, Lady Dufferin Hospital,  
Aligarh, U. P.*

A WOMAN, 65 years old, came to the Dufferin Hospital, Aligarh, from her village, 40 miles off, complaining of difficulty in micturition of a year's duration, and 'falling of the uterus', which she first noticed 5 years previously.

On examination there was found complete prolapse of the uterus with inversion of the vaginal walls. The external os was seen at the tip of the prolapse and a small atrophied uterine body was felt above and behind it. On palpation of the inverted anterior vaginal wall a number of stones of different sizes were felt in the bladder; some appeared to be very large. A sound could not be passed into the bladder further than half an inch, as it seemed to be full of stones, while the prolapsed uterus could not be replaced owing to obstruction by the stones. There was more or less continuous dribbling of foul-smelling urine, which contained albumin and pus.

The patient was aged, feeble and emaciated. Preliminary treatment with urinary antiseptics was carried out. The suprapubic route was found impassable, so an incision was made in the prolapsed anterior vaginal wall into the bladder. A number of stones, seventy-six in all, were removed; they varied in size from a pea to that of a hen's egg, and were phosphatic in character. The largest weighed  $1\frac{1}{2}$  ounces and all of them together, 4 ounces.



The uterus was replaced and the wound sewn up in layers. Operation for prolapse could not be done owing to the feeble condition of the patient and the septic state of the bladder. She made a good recovery and decided to return to me for the prolapse operation in the cold weather. In the meantime a ring pessary was inserted to keep the uterus up and the patient allowed to go home.

## CARBUNCLE COMPLICATED WITH ERYSIPELAS

By HANS RAJ, M.B., B.S.

*Physician and Surgeon, Ferozepore City*

R. R., male, aged 60 years, came with a large carbuncle, about six inches in diameter, on the back, on the 10th August, 1936. The carbuncle was covered

with dirty dressings; it was discharging pus and contained large sloughs. The patient had high temperature and complained of weakness. I advised operation, but he refused and went away taking some 'barber's' ointment with him.

He came back after eight days in a moribund condition with extensive erysipelas on the back, shoulders, front of the chest and abdomen. The temperature was high and pulse 128 per minute. The carbuncle was covered with dirty ointment and was still discharging freely.

I injected him at once with antistreptococcal erysipelas serum (Bayer) and prescribed an iron mixture.

The carbuncle was fomented and cleaned with boric compresses. The injections were repeated twice a day and antiseptic dressings and compresses were continued.

The rash began to disappear and the temperature came down in three days. By the end of the 7th day the erysipelas had disappeared, the wound cleared up rapidly and showed signs of healthy granulations. The iron mixture was stopped and Prontosil tablets (Bayer) were given by mouth. The wound healed up without operation more quickly than usual in such cases and the man was discharged cured in a month.

It is interesting to note that the wound, previously unhealthy, full of pus and sloughs and riddled with openings, manifested marvellous recuperative power and dried up quickly, after the erysipelas abated.

## A MELANOTIC SARCOMA OF THE ANAL REGION

By NAND LAL BAJAJ, L.S.M.F. (Hons.)

*In charge, Civil Dispensary, Barsar, Kangra District*

S. R., aged 74, male, was admitted into my dispensary for the following complaints:—

- (i) Frequency of and difficulty in defæcation.
- (ii) Inability to sit down.
- (iii) Discharge of blood and mucus in stools.
- (iv) Frequency of micturition.

These symptoms began about four years ago but the man was relieved of them about 1½ years ago by an operation in this dispensary. The dispensary record showed that a tumour of the rectum was removed successfully but the relief lasted for only about a year.

*Local examination.*—A blind external fistula with thick hard margins on the left side of the anus was seen. There were a few black granules at the bottom of the fistula. Per rectum, a hard irregular mass chiefly occupying the posterior wall of the rectum and anus could be felt. It was continuous with the hard mass forming the fistula outside the anus. The growth was partly movable from side to side, and bled on examination. Hæmorrhoids were present. The prostate was enlarged and smooth. The inguinal glands were very slightly enlarged, freely movable, discrete and painless. Lumbar glands were impalpable.

Clinical examination of other parts of the body did not indicate any evidence of metastasis.

Under chloroform, after preliminary preparation, the sphincter ani was dilated and the tumour drawn out of the anal orifice and completely excised. It was about the size of an ordinary orange, irregular in shape, hard in consistency and dark purple in colour except a small patch which was black. The piles were ligatured and excised. The tiny mass with a fistula in it located outside the anus was removed as thoroughly as possible.

A fortnight after the above operation a black neoplasm as big as an almond and with three openings

in it developed and had to be cut away with an area of the healthy tissue around it. The growth contained numerous tiny pigmented granules.

Both the tumours were sent for report to the bacteriologist to the Government at Lahore and the report received was 'melanotic sarcoma'.

The operation wounds having healed, the patient was discharged with advice to come to the dispensary from time to time for examination.

The points of interest in this case are the old age of the patient at which sarcoma appeared, non-occurrence of any apparent metastasis, non-involvement of the glands draining the part, the unusual site for sarcoma and lastly its peculiar spread into the rectal region.

## A STONE IN THE PREPUCE

By S. K. SHRIVASTAVA, L.M.P.

*In charge, State Hospital, Nagod, C. I.*

A MALE, aged 30 years, came to the State Hospital, Nagod, on the 13th September, 1936, with the following complaints:—

- 1. Pain and burning during micturition.
- 2. Increased frequency of micturition and passage of urine only drop by drop.
- 3. Pus-like discharge from the organ.

*Previous history.*—For about four years he has had trouble during micturition and about a year ago he apparently had gonorrhœa with purulent discharge and severe burning pain during micturition. There was inflammation in the prepuce and phimosis.

*Present condition.*—General health good. There was phimosis and the prepuce was inflamed. On passing a probe into the orifice a hard body could be felt. The patient was prepared next day for circumcision. On slitting the prepuce a concretion about the size of a betel nut and weighing thirty grains was found. Circumcision was completed and a sound passed into the bladder to see if there were any calculi in it, but none could be felt.

The man was given copaiba-sandalwood oil mixture with bromide. On the sixth day after operation the sutures were removed, the wound healed by first intention and the patient was discharged cured on the 25th September, 1936.

My thanks are due to Lieut.-Colonel R. Kharegat, I.M.S., agency surgeon in Bundelkhand, Nowgong, C. I., who very kindly gave me permission to publish the case.

## A CASE OF ACUTE INFECTIVE MYELITIS (INFLUENZAL) TREATED WITH MILK INJECTIONS

By B. H. SINGH, M.C.

LIEUTENANT-COLONEL, I.M.S.

*Civil Surgeon, Burdwan*

R. S. R., a police constable, aged 43 years, was admitted into the Police Hospital, Burdwan, on 18th October, 1935, with a temperature of 101°F.; he gave a history of exposure while on night duty on the 16th. He was discharged on 28th October, but was readmitted on the 6th November, complaining of some weakness in the legs, pain over the bladder region, frequent micturition and constipation. In this, the initial stage of the disease, he had pyrexia (100°F.), headache, malaise, sore throat and numbness with tingling in the lower extremities.



He was transferred to Fraser Hospital, Burdwan, under Dr. G. C. Sarkar, on the 7th November for investigation and treatment. In the second phase of his disease (the pre-paralytic stage) he complained of weakness gradually spreading upwards in both legs and slight weakness of the arms as well. The fever had subsided but retention of urine was noted. This was soon followed by the paralytic stage or stage of actual invasion of the central nervous system, and paralytic phenomena appeared. The localization of the lesion was noted to be in the lower dorsal region. He had by this time lost all motor functions of the lower limbs, but he could raise his hands and move his arms. The upper part of the body was quite free from paralysis. The palate, the pharynx, the larynx, and the grip of the hands were all unaffected. There was slight loss of sensation to pin prick and light touch tests in both legs, and an indefinite hyperæsthetic zone corresponding to the lower dorsal region was present (girdle pain). The knee and ankle reflexes were exaggerated and Babinski's extensor response was positive. The triceps and biceps reflexes were either normal or slightly exaggerated. The Wassermann reaction was negative. The blood count showed moderate leucocytosis—12,000 per c.mm., polymorphonuclears—75 per cent, small mononuclears—18 per cent, large mononuclears—6 per cent, eosinophils—1 per cent and other cells nil.

*Treatment.*—The patient was put in a soft bed and proper precautions were taken to avoid the development of trophic lesions such as bed-sores. He was catheterized every 8 to 10 hours, and an enema given daily for constipation, as a routine. When evidence of cystitis appeared, urinary antiseptics, neotropine, urotropine, etc., were administered and a bladder wash with permanganate of potash lotion given. Potassium iodide in moderate doses was given a trial, but the patient took an unfavourable turn. He was showing signs of increasing toxæmia and becoming drowsy with moderate pyrexia (100°F.). By this time, and in spite of strict vigilance, bed-sores appeared, and the patient was rapidly going down hill and was in a very serious state.

At this stage it was decided to try non-specific protein therapy by milk injections. The initial dose of 3 c.cm. was given intramuscularly into the buttock on the 18th November, i.e., 11 days after admission into the Fraser Hospital. The first injection made no appreciable change, and a second injection of 5 c.cm. was given three days later. The bladder irrigation was kept up, but the other accessory treatments were all omitted. The response after the second dose was somewhat encouraging; he could now feel fullness of the bladder—certain evidence of return of the vesical reflex. Encouraged by this a third injection of 5 c.cm. was given after three days, and it was noted that he could slightly move the toes. The general outlook also was brighter, the toxæmic signs were less obvious than before, and except for the re-active rise of temperature after the injections, the temperature was now normal. A fourth injection was given, and after this the bladder showed a return to voluntary power and catheterization was no longer necessary. The treatment was continued and he gradually regained the power of his legs, his bed-sores healed and the girdle pain also subsided. Seventeen days after the first milk injection the patient could move his lower limbs. He was discharged on the 25th December, 1935, when he had just regained enough strength to stand with the help of sticks, as his people were very anxious to take him home.

The total quantity of milk administered in this case was about 33 c.cm. in 7 injections; all were given intramuscularly at intervals of 3 or 4 days. He was given 8 months' sick leave and when he returned from home in September 1936, he looked fit, but said that he still felt a little stiffness in his legs and could not run. He could, however, walk well, and sit and stand normally.

Milk therapy is much used in the Fraser Hospital, Burdwan, and my results in the reduction of malarial spleens have been recorded in the *Gazette* in September 1933. It has also been tried in several other conditions, with good results but we had never before tried it in a disease of this nature. This case is reported in order to draw attention to the possibility of using milk to raise the natural resistance of patients when their condition appears hopeless and they have failed to respond to ordinary treatment.

## OSTEOMALACIA; TORSION OF THE PREGNANT UTERUS

By S. MOHD. ANWAR

Jubil Hospital, Amritsar

*Case report.*—A woman, aged 26, small and ill-developed, was delivered of a full-term child by Cæsarean section.

*Previous history.*—When a girl of twelve, she had a fall and has never walked properly since then. She was married at the age of fifteen and was delivered of a child by Cæsarean section three years later. She has had severe osteomalacia since then.

On examination it was found that both arms had been broken (*see figure*) and that the pelvis was so



distorted that natural delivery was impossible, so Cæsarean section was performed upon her for the second time. The uterus was long and narrow and the usual incision was made through what was taken to be its anterior surface, but after successful delivery of the child and on proceeding to sew up the incision it was found that the organ was twisted so that the scar of the previous operation was situated behind. On account of the impossibility of natural delivery ever taking place the woman was sterilized. She made a good recovery and the child appeared quite normal.

I wish to thank Lieut.-Col. Padaya, I.M.S., who was in charge of the case, for permission to publish this report.



# Indian Medical Gazette

JANUARY

## MILK

THERE is no fact so obvious that it cannot be repeated again and again without advantage to someone, as, in a world where values are continually changing, even into the minds of the most balanced, doubt must always manage to creep sometimes. Further, there are writers and teachers with a paradoxical type of mind who consider that to repeat a truth is commonplace but delight in contradicting the teachings of established custom; these dangerous influences have to be counteracted continuously. No truth has been so firmly established by long human experience and so completely confirmed by recent scientific investigation, is so obvious and yet seems to need so frequent repetition as that which is contained in the sentence quoted from the League of Nations' Report on the nutrition problem—'milk is the nearest approach we possess to a perfect and complete food, and no other single food can be used as a substitute'.

Milk not only contains protein, fat and carbohydrates in very suitable proportions for human food but in each instance the nutritive constituent is in an ideal form for easy assimilation. Caseinogen, which is the most important of the milk proteins, the total of which amounts to about 3 per cent, is a protein of high biological value in a condition of almost perfect solution. The carbohydrate constituent (4 to 5 per cent) is lactose, which has the useful property of not being sweet so that it does not tire one by its insipidity, and of withstanding the action of yeasts longer than most sugars. The fat (3 to 4 per cent) in milk is in the form of an extremely fine emulsion which makes it particularly easy to digest.

Milk contains a sufficient quantity of the essential metals, the only exception being iron which is present in very small amounts. Finally, the vitamins A, B, C and D are all represented; vitamin D is present in 'summer' milk in large quantities but 'winter' milk is poor in this substance (in this country the vitamin-D content is nearly always high), and the vitamin-C content is also low and this vitamin is readily destroyed by boiling, but vitamins A and B are present in adequate quantities. That is to say, with the addition of iron, milk provides a diet of high nutritive quality with all the constituents that recent nutritional investigation has shown to be necessary for health, and, thus, science has confirmed a conclusion to which centuries of human experience had already led us.

Probably the most striking tribute that can be paid to milk as a food is its survival as a

substance of primary importance in the human dietary during the pre-bacteriological days when it was rightly considered as a prime factor in the spread of epidemic diseases. Even to-day when we do know how to negative its potentialities as a disease carrier, it provides more problems to the sanitarian than any other article of food. It is an ideal medium for bacterial propagation, far better than water on account of its nutritive properties and far better than other equally nutritious foods on account of its fluid consistency. Nearly all the problems connected with milk arise from its distribution to the consumer after it leaves the udder of the cow, and laws connected with milk are framed to protect the consumer not only from being supplied with contaminated milk but also from being cheated by dilution of the milk by the addition of water.

The laws that have been introduced in many countries, England for example, have been very necessary and have achieved the object of ensuring that the consumer gets an uncontaminated milk of good quality, but there has been another side to the picture. Twenty-five years ago Sir Henry Newman, in a lecture to students at St. Bartholomew's Hospital, remarked that he viewed with concern the increasing load of laws and regulations applied to milk, because, he said, it was causing, and would cause (and, we can now say, has caused), a rise in the price of milk so that the poorer classes would be unable to afford to purchase it. The present-day public health tendency is, without in any way lessening the stringency of the regulations, to make them easier to work, and by means of marketing boards to keep the retail price of milk at a low level without making its production economically unsound to the dairy farmer; that is to say, the nutritional rather than the bacteriological aspects of milk are receiving the greater attention.

The problem in India is of course a different one. In England, even in the rural areas distribution is the main difficulty, whereas in India this is only of importance in a very small percentage of the population, as even in towns a cow is often kept in the well-to-do households. The problem in India is the supply itself, which at less than 3 ounces *per capita* is about a quarter of that of Great Britain and one-sixth that of the United States, not so much on account of the shortage of cattle but on account of their poor quality and, in many parts of India, of the shortage of suitable grazing.

His Excellency the Viceroy has given a much-needed stimulus to the milk-supply problem by importing bulls of good milk-producing strains and thereby trying to raise the quality of the cattle in India. If his example is followed, as we hope it will be, one aspect of the problem will in time be solved; but, as the Viceroy himself has pointed out, it is useless to improve the breed of cattle unless they can be provided

with adequate food for their nourishment and this is a problem that is exercising the minds of agricultural experts in all parts of India to-day. There is apparently very little prospect of extending to any great extent the grazing acreage but there is much that can be done to improve the quality of the existing grazing and to supplement it by growing suitable fodder crops. Some research work on this subject has been done and, though more requires to be done, a much more urgent need is widespread propaganda to disseminate knowledge that has already been gained.

With that of grazing and fodder, inevitably arises the question of disposal of the enormous

numbers of useless, or nearly useless, cattle that produce about a *pow* of milk a day and eat nearly as much of the available food as those that give ten times as much milk. This latter problem involves religious principles that are very difficult to overcome.

There is here an opportunity for the combined efforts of the departments of medical research, agriculture and animal husbandry to make a great drive during the next few years and to increase the milk supply in this country to a figure more in keeping with India's requirements, as, with a Viceroy who has such special experience and interest in all these subjects, they can count on his whole-hearted support.

## Special Articles

### MEDICAL INTERFERENCE

By M. O. SCHIMELGOR, M.D. (Moscow)

*European and Indian Nursing Home, Sadir Road,  
Peshawar*

THROUGHOUT medical history there has been a struggle between two opposite opinions about the relation between different organs, their reciprocal influence on one another, and their relation through the nervous and hormonal systems. The present level of medical science justifies the belief that the reciprocal influence of organs is effected through the endocrine vegetative system as a whole with the assistance of the psychic. The psychic functions in the process cannot be separated from the functions of the endocrine vegetative system. The method adopted in some countries of blocking the sympathetic nervous system by novocaine is probably based on the fact that novocaine interferes with the functions of the endocrine vegetative system, thereby affecting the cortex cerebri and other organs. In this way the whole organism becomes affected, and particularly so that part of it in which the normal process is for some reason weakened, *i.e.*, its part affected by the disease.

The effect of novocaine is short lasting, but the favourable reaction often sets in only after a few days; therefore we see here not the effect but the after-effect of novocaine.

Every interference with a process of the organism or with the normal inter-relation between organs calls forth a protective reaction of the whole organism. There is no doubt that such reaction is organized by the psychic endocrine vegetative system. The enhanced protective activity of the organism may affect the disorganized functions of the organism (*i.e.*, the illness), and cause the illness to follow a more favourable course. It goes without saying that the intensity of the protective reaction

(both generally in the whole organism and locally in the different organs) and its form depends on many conditions, such as the potency and the kind of the irritant, the place of its application, the nature and acquired qualities of the organism, the measure of stability or instability of the tissues, organs, and organism as a whole.

After the administration of a strong, but not excessive, irritant the protective reaction develops in such a way that the morphological and functional disorganization caused by the irritant disappears, and balance in the functions of the organism sets in again. In a case where previous to the administration of the irritant there existed somewhere in the organism a state of disturbance, the protective reaction, generated by the irritant, may beneficially affect the disturbed area. If, however, the irritant should be excessive, the protective process may prove inadequate, and, consequently, not only may the effects of the irritant survive, but other functions of the psychic vegetative endocrine system and of the organism may become disorganized, and the original disturbance may be accentuated. Such a conception of the reaction of the organism refers to any active therapeutic interference such as milk, serum, operation, etc.

The paradoxical results which sometimes appear after some therapeutic or surgical interferences find their explanation in the protective process described above and generated by them in the organism.

We know that in cases of angina pectoris the removal of the third sympathetic knot has beneficial results for the patient, though it has been proved by experience that this knot is the centre of the nerves dilating the arteria coronaris. What then is the reason for the effect of the operation? The whole of the psychic vegetative endocrine system reacts to the grave

irritation caused by the operation; the disease in the muscles, nerves and arteries of the heart is subjected to the action of the protective process and an amelioration ensues, in spite of the fact that the centre for dilating the cardiac arteries has been removed; the remaining vegetative endocrine system, as a whole, counteracts the effect of the operation; and in the course of the general reaction of the organism the hormonal action of the various organs is stimulated (as we know, the adrenalin from supra-renal glands, and the hormone-like substances from the striped and cardiac muscle, dilate the cardiac arteries).

The following is a second illustration to our subject. It is known that the hormones of the parathyroid gland set free calcium in the blood, similarly to the adrenalin setting free sugar. Many believe that the disorganization of the functions of the parathyroid gland is responsible for arthritis deformans. Surgeons, therefore, have removed the parathyroid gland in cases of various bone diseases, and have often achieved thereby good results. A certain surgeon of Straasburg, while performing an operation for the removal of the parathyroid gland in a patient suffering from arthritis deformans, was unable to find the gland he sought and stitched up the wound without having removed the gland. The effect of the operation, however, appeared to be the same as if the gland had actually been removed. After that experience the surgeon used to incise the parathyroid gland and sew up the wound, and that operation proved to be just as effective. Here again the powerful irritation was responsible for calling forth a violent defensive reaction in the whole organism, and the general recuperating process affected in its action the existing disorganization in the feeding of bones and joints. Many more examples of similar reactions of the organism can be cited, but the above is sufficient to illustrate our point that improvement is often due to the defensive reaction of the organism and not to the operation, or, to be more accurate, improvement often takes place in spite of the operation (removal of the third sympathetic knot and the removal of the parathyroid gland).

We have seen that a considerable irritation of the vegetative endocrine system, caused either by a physical, mechanical or chemical agency in any part of the organism, produces a general reaction in the organism. It goes without saying that, in the presence of a disease in the organism, this reaction may lead either to an improvement in the course of the disease, or to a deterioration, or else have no marked effect on it at all, according to the conditions of the organism, to the nature of the disease and the kind of the irritation.

We are inclined to think that in the instances quoted above the effect, in addition to the surgical action, was due to a considerable degree

to the psychological factor as well. Often the general protective reaction of the organism described above is generated by the injection of certain substances, milk, water, etc.

It has already been mentioned above that various effects which may follow the protective reaction of the organism are dependent on the state of the organism, its acquired and inherited peculiarities, the nature of the medical interference, etc. There is, however, a specific peculiarity attached to protective reactions, *viz*, the medicine does not act when it enters the organism and its cells, nor even when it is in the cells, but after leaving them. Actually, when a medicine, an alien matter in the organism, calls forth a protective reaction, that reaction reaches its full vigour of reconstruction after the medicine has left the cells of the body and the organism in general. As the reaction does not stop with the ejection of the medicine but continues for a considerable time, the organism, and particularly the diseased organ, has the chance of wholly concentrating on re-establishing the functions affected by the disease. When a medicine is repeated, every subsequent dose calls forth again a general reaction of the organism, directed primarily to the ejection of the irritant. It is clear that after a number of repetitions of a medicine, particularly in large doses, the protective powers of the organism may be considerably weakened, and consequently the protective reaction may prove inadequate; this should always be kept in mind when repeating medicines.

In that case we may notice something similar to an agent of infection which has entered the organism and is spreading. Repeated ingress into the organism of bacterial toxins from the seat of infection, particularly if they enter in large quantity, may, to a larger or smaller extent, interfere with the development of the protective reaction. Therefore it is only after the administration of the medicine has been discontinued that the best conditions set in for the full development of the protective reaction, as well as for the reaction of reconstruction by which the former is followed.

It should not however be forgotten that any therapeutic method of producing a violent reaction contains an inherent danger. As already mentioned above, not every violent reaction that may be called forth will necessarily develop as a protective reaction, and a deterioration may set in in the region of the disease, or even in another region, as a result of the direct pathological action of the medicine. These effects of medicines often remain undetected, and sometimes come to light only after a considerable time. In some cases they are very difficult to establish, and only a very careful scrutiny of the antecedents of the patient, enquiries from him about the state of each organ and its functional peculiarities, both in the past and present, will help to identify the negative effect

of previous treatments on the health and energy of the patient. As an illustration of the negative after-effect of violent medical therapy, the following example may be cited: During a recent epidemic of jaundice in Germany, it was established that those cases in which there had been at some previous time salvarsan treatment had been particularly serious and had shown a great percentage of deaths.

Bearing in mind that the action of any medicine or medical interference actually amounts to the reaction they generate in the organism as a whole, that they may cause serious consequences in the organism, both immediately and in the more distant future, and that therefore we should be able to assess the conditions of the organism as a whole and observe its changes, it would appear that the theoretical and practical medical science has the following questions to solve:—

1. The minute study of the protective reactions of the organism as a whole, consequent on medical interference; the study of the immediate as well as more distant results of such reactions.

2. Practitioners should not be guided only by the action of medicine but also by the individuality of the patient, and should bear in mind the possible reaction of the organism, both immediate and distant.

3. The action of various medicines should be further investigated.

4. The effects of the various therapeutical interferences both on particular organs and on the organism as a whole, *i.e.*, on the co-ordinating system of the organism (vegetative endocrine system and cortex cerebri) should be re-investigated.

## THE TREATMENT OF PILES

By H. WILLIAMSON, O.B.E., M.D., F.R.C.S.E., M.R.C.P.  
MAJOR, I.M.S.

*St. George's Hospital, Bombay*

THE ætiology of this 'universal and distressing complaint' which is very common in India is variable and need not be discussed in detail, though heredity, constipation, sedentary habits, child-bearing, middle age and drastic methods of cleaning the anus are all important factors, while in later life carcinoma of the rectum and enlarged prostate must never be forgotten.

On looking at a patient's anus the surgeon cannot help noticing the radially arranged rugæ in the skin: the rugæ, of course, allow the skin to stretch during defæcation. From this simple observation a very important moral can be drawn, namely that all incisions and scars in this region should run parallel with the rugæ, that is in the long axis of the bowel, otherwise stricture will result. Just as the string in a pair of pyjamas holds the trousers up, so will a ring of fibrous tissue round the anus hold the

fæces in, and, for the same reason, it does not stretch.

*Internal piles.*—A few inches above the anus the superior hæmorrhoidal artery, which is the terminal branch of the inferior mesenteric, divides into two, each branch subdividing. The artery is accompanied by veins, varicosity of which is the cause of internal piles. One might therefore expect there to be an even number of piles, but this is not so, the usual arrangement being an ace-of-clubs formation, one in front and two behind, probably because of the situation of the three bands of longitudinal muscle fibre in the large bowel.

*Palliative treatment.*—In very mild cases, where the cause is unlikely to persist, plenty of exercise, plenty of fluids, avoidance of alcoholic or other excesses, and the prescription of a teaspoonful of confection of sulphur and senna each night or a tablespoonful of liquid paraffin twice a day will often effect a cure, especially if helped by a local application, of which there are many on the market.

*Injection treatment.*—This gives good results, and should always be tried when the piles are not inflamed, ulcerated, prolapsed or very large, and when the patient can be kept under observation, in case it needs to be repeated. Apart from these exceptions the only one I know is the hardy Pathan, who generally prefers something more drastic.

Many specula and syringes, usually called by the name of the inventor, have been devised, but the ordinary fenestrated Sim's speculum supplied by government does very well and a small 'Record' syringe with a fine needle is as good as any other. A sterile solution of 5 per cent quinine bishydrochloride with 10 per cent urethane in water gives very good results. It can be had in 2 c.cm. ampoules prepared by Messrs. Parke, Davis and Company, or can be made up in a teaspoon before use. Another good solution is one of 15 per cent carbolic acid in equal parts of glycerine and water.

*Method.*—With the patient on his left side and his right foot flat on the table so as to abduct the right knee, the well-vaselined speculum is introduced and slowly opened. The surgeon now waits a moment to allow the piles to swell, a process more easily seen with a flashlight. Three main piles are generally visible. The needle of the syringe is now pushed into one of the piles and not more than half a c.cm. of fluid injected, the process being repeated with the other two piles. If there are more than three, only three should be injected at one sitting, and if the operation has to be repeated, three weeks should be allowed to elapse, as this gives time for the injected piles to shrink. If, after injecting a pile, the surgeon decides that the case needs operation, the latter should be deferred; I once tried combining the two and the result was a stricture. External piles should never be injected.

As the rectal mucosa is insensitive, injection is practically painless; in fact, if the patient complains of the puncture the surgeon can be pretty sure he is making it too low down. For a few days after the operation the patient has slight discomfort and a feeling of fullness in the rectum, but this soon passes off.

**Clamp and cautery.**—The operation about to be described was invented by Dr. Neve of Kashmir, and is done in Quetta and Shikarpur by Sir Henry Holland, to whom, amongst many other things, I am indebted for my knowledge of it. Properly done, it has many advantages. It is practically bloodless, an important factor with an anæmic patient; it is easy, so can be done in out-stations; it is quick, and, above all, it is not likely to be followed by hæmorrhage, recurrence or stricture.

**Preparation.**—The morning before the operation the patient is given an ounce of castor oil with 20 minims of tincture of opium and kept on a light diet; the evening before operation he is given a further 10 or 15 minims of tincture of opium with a drachm of tincture catechu, and next morning, about two hours before operation, a soap-and-water enema.

**Anæsthetic.**—Half a cubic centimetre of stovaine (Barker's solution of 10 per cent stovaine in 5 per cent glucose solution in distilled water) is injected through a lumbar puncture with the patient sitting up. This gives perfect anæsthesia and relaxation, but is apt to be followed by severe headache if much cerebro-spinal fluid is allowed to escape. Stovaine takes about ten minutes to become 'fixed', so the patient's head and neck should be kept above the pelvis for that time, after which it does not matter. If for any reason a spinal anæsthetic cannot be given, any general anæsthetic will do, but the patient must be watched when the anus is stretched, as he is apt to stop breathing if not properly under. Local anæsthesia is difficult for the inexperienced and is usually accompanied by poor relaxation of the sphincter.

**Instruments.**—A Neve's pile clamp and three iron cauteries (see figure 1), three or four pairs of Kocher's forceps, and a pair of scissors curved on the flat are all that is required. The clamp is like a pair of carpenter's pincers with curved blunt edges and a screw to screw it tight, and the cauteries are small pokers with a wooden handle, and a ball on the end which fits easily inside the blades of the clamp.

#### THE OPERATION

**Step 1.**—The operator gently but firmly stretches the sphincter with his gloved and vaselined forefingers or thumbs.

**Step 2.**—The piles are seen to swell and may partly prolapse.

**Step 3 (figure 2).**—Each pile is caught with a Kocher's forceps, the tip of which points to the centre of the anus.

**Step 4.**—Neve's clamp is applied, care being taken that its jaws point to the centre of the anus.

**Step 5 (figure 3).**—Each pile is snipped off with a pair of scissors curved on the flat, the Kocher's forceps remaining attached until the pile is removed.

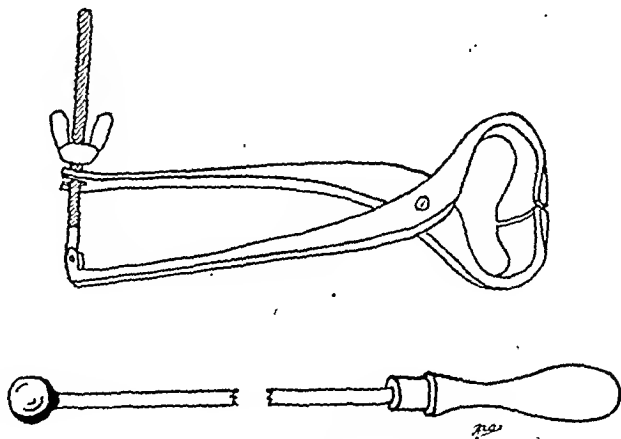


Fig. 1.—Neve's clamp and cautery.

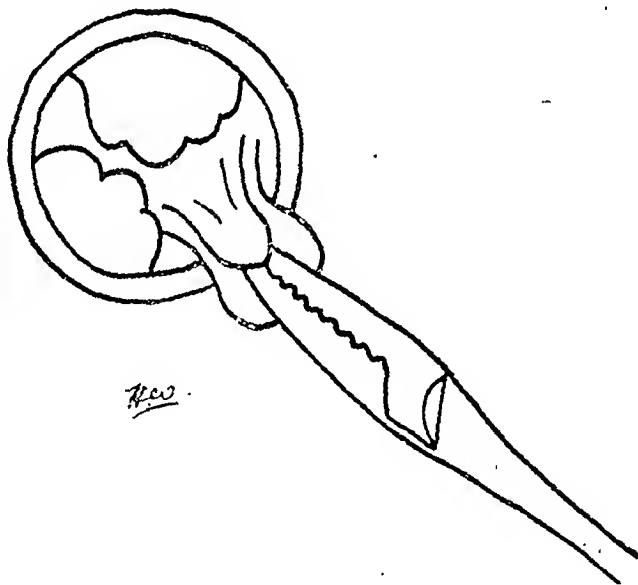


Fig. 2.—Seizing the pile.

**Step 6 (figure 4).**—The raw edge of the pile is well cauterized, the clamp being held away from the peri-anal skin so as not to burn it.

**Step 7.**—The clamp is unscrewed and gently opened, after which it is dipped in cold lotion to cool it before the next pile is treated.

**Step 8.**—The other piles are dealt with in the same way.

**Step 9.**—A suppository containing one grain morphia is gently inserted into the rectum, followed by a wick of vaselined gauze to prevent adhesion between the opposite sides. Large tubes or rolls of gauze should be avoided as they separate the cauterized edges and lead to bleeding.

**After-treatment.**—The patient is kept in bed for ten days, the bowels being opened on the fifth day: the best aperient is a dose of castor

oil, followed in four hours by an enema of equal parts of hot soapy water and olive oil.

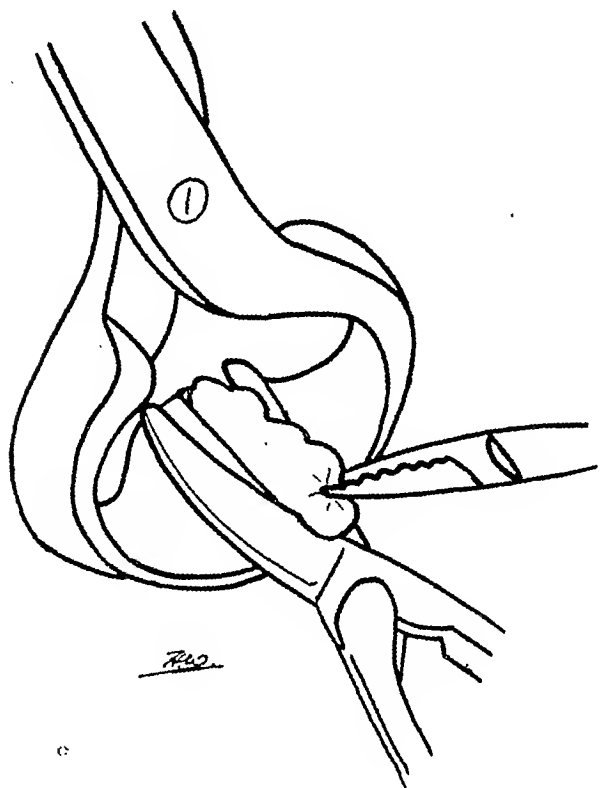


Fig. 3.—Cutting off the pile.

The above operation is suitable for most cases, and I have used it successfully even when the piles were prolapsing, but it must never be used for external piles. Those who prefer to suture internal piles will find the method described below for external piles an easy and bloodless one.

*External piles.*—The 'thrombotic' pile, due to the rupture of a vein, and looking like a small blue grape, can be incised if very painful, and the clot evacuated, otherwise fomentations or an analgesic ointment may be applied.

The other kind of external pile is an extension or relic of an internal one, and varies in constitution from a tag of skin to a vascular mass. The 'three needles' operation, so useful in anterior staphyloma of the eye, is a good way of dealing with the condition. Unless internal piles are being operated on at the same time, a local anæsthetic with some adrenalin is injected into the base of the pile, which is then picked up with a pair of forceps. Three (or more, or less) curved needles are now passed through the base of the pile, parallel with the anal ring (see figure 5). The pile, with the needles in position, is now snipped off with a pair of scissors, the needles are pulled right through and the ligatures tied, thus bringing the raw edges together and allowing no time for infection or hæmorrhage. The top stitch should be tied round the upper edge of the stump so as to catch any artery.

*Prolapse of the rectum.*—A word about the treatment of this condition may be helpful, as

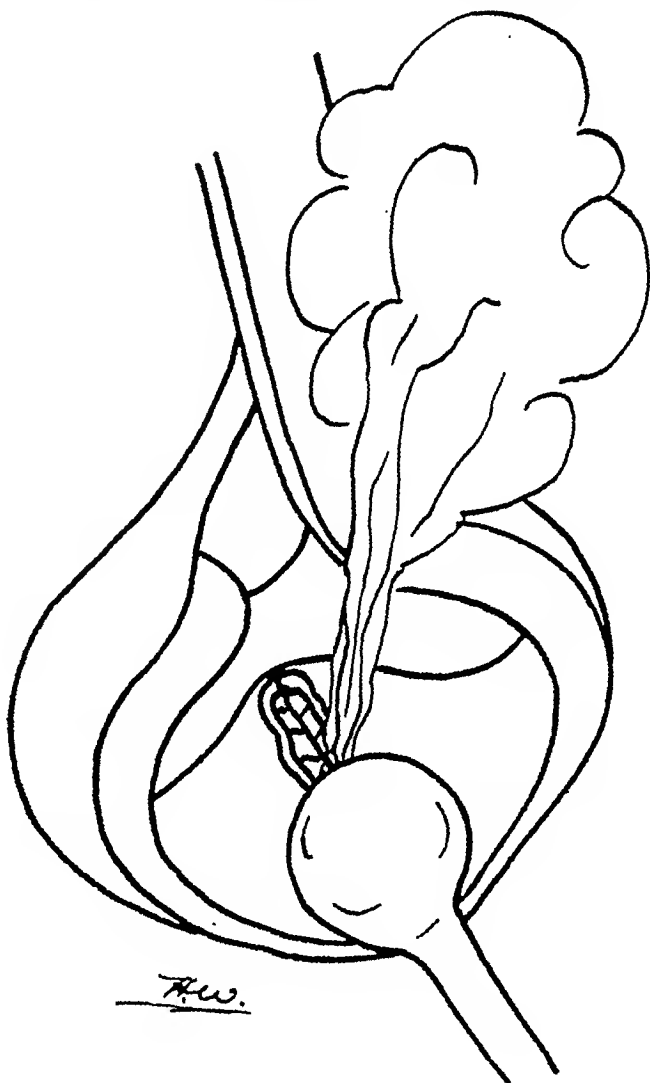


Fig. 4.—Cauterizing.

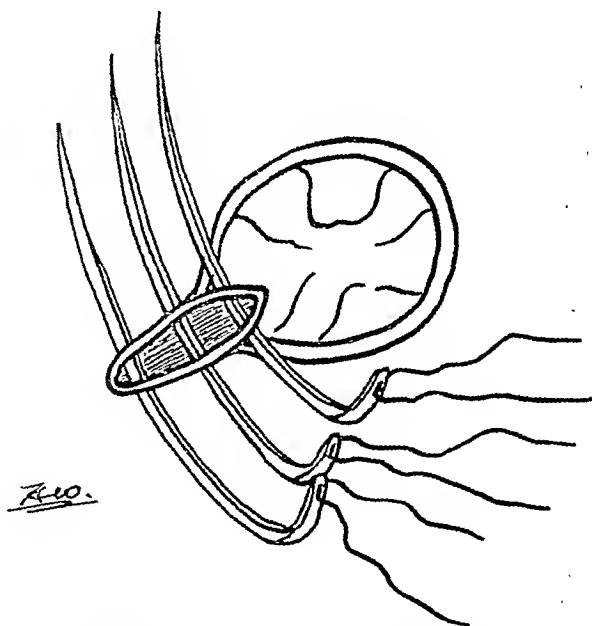


Fig. 5.—The 'three needles' operation.



the procedures recommended in textbooks on operative surgery are rather formidable. When palliative measures fail the following method will often effect a cure. The surgeon's left forefinger is placed in the patient's rectum, and, guided by it, the needle of a syringe containing 1 c.cm. of rectified spirit is passed up under the mucous membrane from the mucocutaneous junction for a distance of one to one-and-a-half inches, the prolapse, of course, having been reduced first. Four punctures are made, one in front, one behind, and one at each side, 1 c.cm. of spirit being injected at each, and care being taken not to injure the male bulb or urethra.

A piece of stout silkworm gut, with a large curved needle at each end, is now taken, and

one of the needles passed up inside the rectum, somewhat to one side, for about two inches (less in a child). The needle is then thrust through the mucosa and brought out through the skin lateral to the coccyx. The other needle is similarly manoeuvred on the opposite side and the ends of the silkworm gut emerging through the skin are tied over a piece of gauze, thus slinging the rectum to the coccyx.

When the stitch is removed on the tenth day there may be some sepsis along its track, which is no drawback as it helps adhesions.

*Pruritus ani.*—If treatment of the apparent cause fails to relieve the pruritus by far the best remedy is a single intensive dose of x-rays given by a good radiologist.

## Medical News

### PRESIDENTIAL ADDRESS DELIVERED BY MAJOR-GENERAL SIR CUTHBERT SPRAWSON AT THE SIXTH SESSION OF THE MEDICAL COUNCIL OF INDIA, ON 5TH NOVEMBER, 1936

GENTLEMEN,

Your president has not hitherto addressed you on council matters as a whole. In the earlier days of our constitution our progress was necessarily slow and perhaps laborious; but we have now reached a stage when with more rapid development in the present and the prospect of changes in the future it becomes advisable that the president should rehearse from time to time our activities and explain what your executive committee have done and are doing. Your executive committee will be well acquainted with the matters on which I shall comment, and a study of their proceedings, especially those of their meeting last August, will inform council members of their activities; but our council meet seldom, and it will, I believe, be advantageous if I review briefly for the benefit of members some matters of immediate interest.

Before I go further I must express a deep personal regret, which I know is shared by all of you, at the death of Sir Fazl-i-Husain. Sir Fazl had much to do with the formation of this council, for he was the member of the Viceroy's Council in charge of the Department of Education and Health at the time of the passing of the Medical Council Act, and many of you here will recollect his address at the opening of the first meeting of this council in March 1934. His death has cut short a career that was about to offer still further opportunities to his administrative ability.

You will be aware that since the last meeting of our council the General Medical Council of the United Kingdom have recognized for registration the medical degrees of the universities of Bombay, Lucknow, Madras and Patna and that in the case of the first three universities this recognition has retrospective effect since February 1930, so that there is now no break in the continuity of the recognition they formerly received. The date from which the degrees of Patna University may be recognized is now the subject of separate consideration by your executive committee. You will have noted that the General Medical Council have accepted for recognition all those degrees that we have ourselves hitherto approved. It will be for you to consider the sufficiency of the degrees of some of the other universities of British India during the present session.

Since the purpose of this council under the Medical Act of 1933 is to establish a minimum standard of higher qualifications in medicine, it follows that we are deeply interested in the medical curriculum and it is for that reason that our Act gives us powers to require from time to time information about courses of study from every medical institution in British India that grants a qualification included in our schedules. The council have already published their recommendations on courses of study; but you will be aware that the work of the medical student has been the subject of recent discussion in several countries and that it is necessary for us to reconsider the curriculum and consequently our recommendations thereon from time to time and to adopt our advice to improved knowledge and experience. It is not the object of our council to implant a rigidity in the courses nor even to suggest an entire uniformity in the methods of different universities; but with a rise in standards and improvements in knowledge and in opportunities it follows that our recommendations on courses of study require revision. The council last year instructed your executive committee to carry out such a revision and your committee have now done so and have sent their revised draft recommendations to the universities for their opinions and remarks. The inspectors of the council after completion of their inspections at the several universities have submitted a general report on both courses of instruction and examination of the universities as a whole, and a copy of this report, with the remarks of the executive committee thereon, has been supplied to each member of the council. These reports have also been sent to the universities, with the revised recommendations on courses, and when their observations are received your committee will place the matter before you.

Apart from the details of instruction that your inspectors have to investigate it is necessary for them also to see that the number of students attending classes is not too great for the capacity of the teachers or rooms or material provided for their instruction. Overcrowding may be estimated in various ways and no definite standards exist beyond which it may be said that the number of students should not rise. Your executive committee have however adopted one such criterion and have recommended that during his period of medical and surgical inpatient work each student should be continuously in charge of not less than five beds. An enquiry on this point from the universities has shown that already the majority of universities are able to comply with this condition: those who fall short of it have been requested to attain this standard.



oil, followed in four hours by an enema of equal parts of hot soapy water and olive oil.

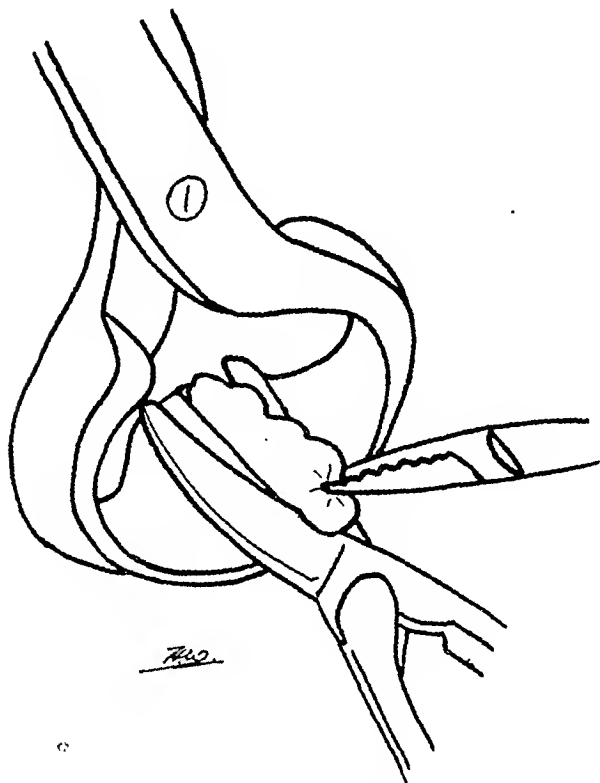


Fig. 3.—Cutting off the pile.

The above operation is suitable for most cases, and I have used it successfully even when the piles were prolapsing, but it must never be used for external piles. Those who prefer to suture internal piles will find the method described below for external piles an easy and bloodless one.

*External piles.*—The 'thrombotic' pile, due to the rupture of a vein, and looking like a small blue grape, can be incised if very painful, and the clot evacuated, otherwise fomentations or an analgesic ointment may be applied.

The other kind of external pile is an extension or relic of an internal one, and varies in constitution from a tag of skin to a vascular mass. The 'three needles' operation, so useful in anterior staphyloma of the eye, is a good way of dealing with the condition. Unless internal piles are being operated on at the same time, a local anæsthetic with some adrenalin is injected into the base of the pile, which is then picked up with a pair of forceps. Three (or more, or less) curved needles are now passed through the base of the pile, parallel with the anal ring (see figure 5). The pile, with the needles in position, is now snipped off with a pair of scissors, the needles are pulled right through and the ligatures tied, thus bringing the raw edges together and allowing no time for infection or hæmorrhage. The top stitch should be tied round the upper edge of the stump so as to catch any artery.

*Prolapse of the rectum.*—A word about the treatment of this condition may be helpful, as

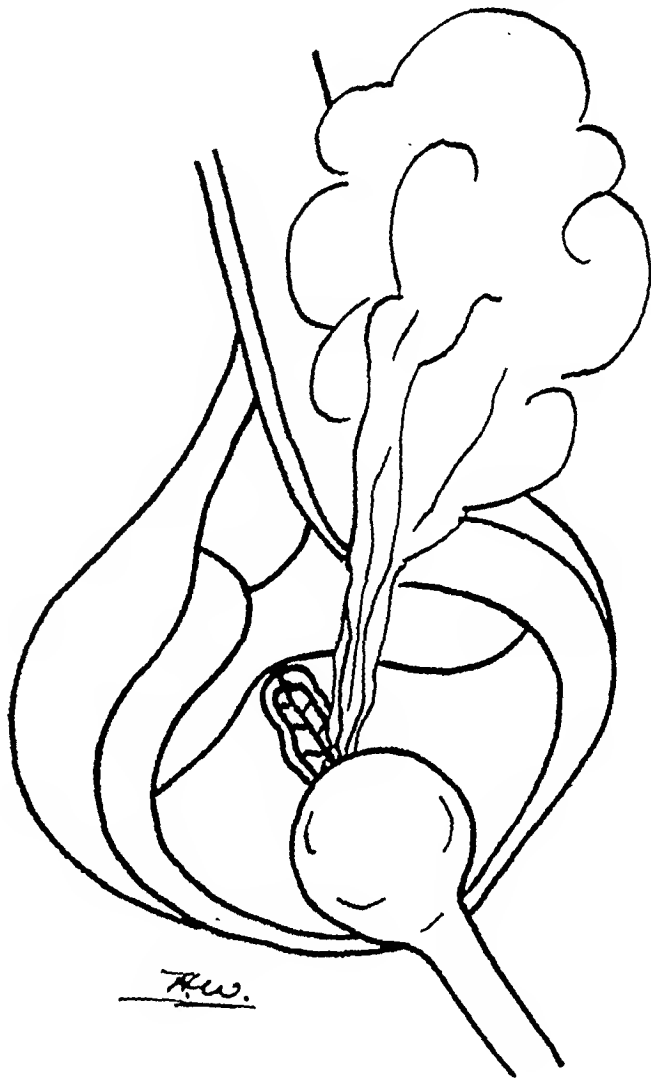


Fig. 4.—Cauterizing.

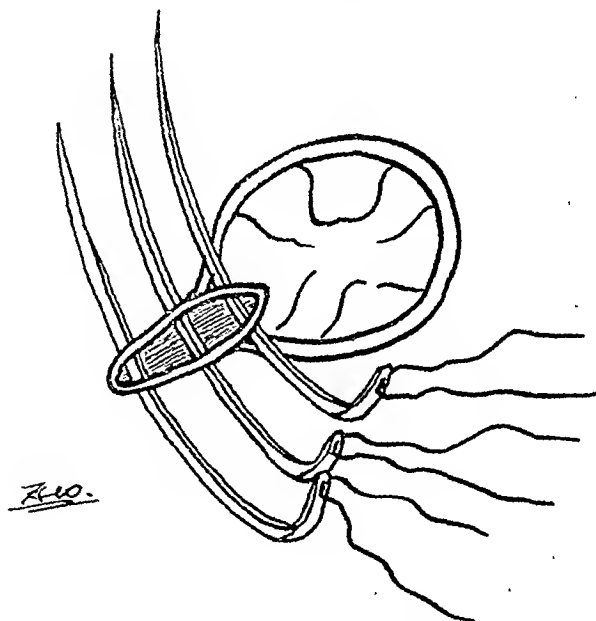


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Another detail of instruction which has exercised your committee is the fact that many, if not most, of our universities do not take sufficient advantage of the great teaching advantages afforded them by a large hospital outpatient attendance. The teaching is sometimes too confined to the wards.

Your executive committee have also been considering the fact that the universities of Bombay and of the Punjab do not prescribe an age-limit for admission to the medical college nor a limit before which a student cannot obtain qualification. A case was brought to my notice where a young man actually obtained degrees of M.B.B.S. and registered them with the Provincial Medical Council before he had reached the age of 21 years. The necessity of preventing such a possibility in future will be brought to the notice of those concerned.

A further question which your committee have under consideration is the conditions in which at certain universities holders of an L.M.P. diploma are admitted to further courses and allowed to sit for examination for an M.B.B.S. degree.

A consideration of the work of the council in the first two and a half years of its existence and of the effects that this work has produced already by improvements in the courses and in details of instruction and examination in several universities and further by leading the medical faculties of these universities to consider several points in our recommendations should bring satisfaction to members of this council. The recognition that has been accorded to medical degrees by the General Medical Council is also a result of the work of this council and our inspectors. Such changes we may regard as direct good resulting from the establishment of this council; but I am still more impressed when I contemplate the amount of indirect benefit that may truly be said to have resulted from the reports of our inspectors and has in several instances brought authorities, both government and private bodies, who are responsible for the maintenance of medical colleges and their attached hospitals, to make improvements costing in some cases large sums of money in order to comply with the recommendations of our inspectors. I need only instance the changes that have occurred or are occurring in colleges and hospitals in Bombay, in Rangoon and in Calcutta in order to illustrate my meaning and, in particular, the increase in the staff and the expenditure of 16 lakhs of rupees on hospital buildings in Vizagapatam. I consider that the council have reason to be well satisfied with their inspectors who have made these reports and have conscientiously performed what must sometimes be a difficult task. Further I consider we may be satisfied with the response that universities on the whole have made to our recommendations and to the criticisms of our inspectors. Criticisms are not always welcome affairs, but, speaking generally, the remarks of our inspectors have been well received and suitable responses made by the universities.

In accordance with section 13 of the Medical Act it is our duty now to enter into negotiations with other countries, especially with those whose degrees are already in our second schedule, so that we shall be able by September 1937 to recommend to the Governor-General in Council what qualifications should in future be included in our second schedule. These negotiations have been commenced by our secretary and your executive committee is informed of them. To some countries, principally those in which Indian Nationals reside in appreciable numbers, but which do not possess medical qualifications of their own, we are making proposals for their recognition of those degrees that are in our first schedule.

You will find a list of these countries in the minutes of the meeting of the executive committee held in last August of which you already have copies. With most of these countries correspondence is still in progress and you will be asked at a subsequent meeting to consider the recommendations of your executive committee

thereon. The usual tone of response from other parts of the British Empire is that these countries are prepared to recognize those of our degrees that receive also the recognition of the General Medical Council, but not to accept other degrees simply because they are in our first schedule. This response is not unnatural and need not cause us any dissatisfaction or diminish regard for our own council. The Medical Council of India is yet young and has to make its reputation abroad as it has already done in this country. We have found also that the General Medical Council is ready to help us and to understand our difficulties and our relationships with that older body continue to be happy.

In accordance with the principles of reciprocity the General Medical Council have sent for our consideration the latest series of reports by their inspectors on the final examinations of the licensing bodies in the United Kingdom. Your executive committee have considered these reports and have drawn the attention of the General Medical Council to various instances where their recommendations do not appear to be observed by licensing bodies, particularly the cases of the Apothecaries Society of London and the Apothecaries Hall of Dublin.

Quite apart from reciprocity the question of the registration or recognition of foreign degrees in India is under consideration by your committee; the point was raised by the Bombay Medical Council in connection with the application for registration by an Indian National possessing an American degree. The Provincial Medical Councils have been circularized as to their opinion on and their present practice in this matter, and when their replies are received the question will come before you with the recommendation of your committee.

These foreign relationships have further implications than may be at first apparent. We are most nearly concerned with French and Portuguese India, because they are parts of this peninsula, and we find there that whatever qualifications a man may possess he cannot practise medicine in those areas unless he be a national of the country concerned, whereas their nationals may practise without restriction in British India. Other countries have adopted a similar protection based not on qualification, but on nationality, and since this is not a question of medical standard this council, however interested, cannot pursue it. I am therefore approaching the Government of India to deal with this difficulty.

Since the last meeting of this council two new provinces of India have come into being. Each will be entitled to representation on the council by a nominated member, and Orissa, which has established a medical register, by an elected representative of the registered graduates. So far members have been nominated by the governments of the two provinces—Lieut.-Col. G. Verghese representing the Government of Orissa, and Lieut.-Col. B. F. Eminson that of Sind, and we welcome them both to our meeting to-day.

Something in what I have already said foreshadows the changes that will occur in this council after its first four years. Other changes will be that the council will be called upon to appoint a secretary from November 1937 and to elect a president in March 1938.

I conclude by remarking on the unremitting interest that all members of your executive committee have shown in the matters that come before them and on their unselfish zeal in travelling far to give to your council's questions the great advantage of their expert advice on all that pertains to medical education.

#### XV CONCILIUM OPHTHALMOLOGICUM

ACCORDING to the decision of the XIV International Congress held in Madrid in April 1933, the next Congress will be held in Cairo, Egypt.

In conformity with the decision of the International Council of Ophthalmology, London, of April 1935, the

meetings will be held from 8th to 14th December, 1937.

The two official subjects of the Congress will be:—

1. Arterial Hypertension of the Retina:  
General Introducers .. H. Wagner and Keith.  
Reporters .. Bailliarat—Clinical and anatomical aspects.
2. Endocrinology and the Eye:  
General Introducer .. Snapper.  
Reporters .. Von Szily, Von Imre, Jeandelize, Lacarrere and Lo Cascio.

The papers should refer preferably to subjects related to the official themes. Only a certain number of papers may deal with independent subjects, provided that the International Council will pass them previously by reason of their originality and interest. The International Council has taken this decision in order to avoid the considerable accumulation of papers which in past Congresses has made efficacious debating extremely difficult. It has been thought preferable that the number of these should be reduced so that they can be discussed with the necessary fullness.

The Local Organizing Committee request the colleagues kindly to send three typewritten copies of the paper intended for reading together with a résumé of not more than 500 words to Dr. Marx, Secretary of the International Council, not later than 1st April, 1937.

Number and size of lantern slides, if any, should be stated, and whether epidiascopes or microscopes (and, if so, how many) are required for the lecture.

On the occasion of the fifth International Ophthalmological Congress a third edition of the Directory will appear. This Directory will contain data concerning the following subjects:—

1. Names (alphabetically arranged) and addresses of all oculists in the world.
2. Titles and volumes of all periodicals which deal with any branch of ophthalmology.
3. Statements of all ophthalmological associations.
4. Hospitals for eye patients.
5. Establishments or institutions for the blind, sight-saving classes, etc.
6. Statistics regarding blindness.

The Secretary of the International Ophthalmological Council (Dr. E. Marx, Oostzeedijk 316, Rotterdam, Holland) would be glad to learn from you whether there are still other subjects of general interest for oculists which, in your opinion, might be included in the Directory.

Two exhibitions, one scientific and one commercial, will be arranged.

Inscription for membership to the Congress is open for every medical man, and those who desire, will please send their applications to the Secretary-General as early as possible together with the sum of 50 Swiss francs, to cover the fees for subscription. The fees for ladies and other associate members of the congressists' families are 25 Swiss francs per person—those can attend receptions, excursions, etc., but are not entitled to attend the scientific meetings, nor will they receive a report of the proceedings of the meetings.

Further details of the Congress meetings, banquets, trips, etc., will be sent in due time, as well as the abstracts of papers and the identification cards for the reduction of railway and other fares.

A housing committee will take charge of facilitating the accommodation and lodgings of the members and their families during their stay in Egypt.

The work of the Organizing Committee will be greatly facilitated if the members subscribe as early as possible.

Papers intended for reading in the Scientific Meetings should be sent directly to Dr. Marx, Oostzeedijk 316, Rotterdam.

All other correspondence should be forwarded to the Secretary-General, XV Concilium Ophthalmologicum, P. O. Box No. 2001, Cairo, Egypt.

DR. M. TEWFIK,  
Secretary-General.

Cairo, April 1936.

#### INDIAN MEDICAL COUNCIL

LIEUT.-COL. B. F. EMINSON, M.B.B.S. (Lond.), D.O.M.S. (Eng.), I.M.S., Civil Surgeon, and Superintendent, Mental Hospital and Medical School, Hyderabad (Sind), has been duly nominated by the Government of Sind, under clause (a) of sub-section (1) of Section 3 of the Indian Medical Council Act, 1933 (XXVII of 1933), as a member of the Medical Council of India.

## Current Topics

### 'Albuminuria' or Proteinuria

By G. A. HARRISON, M.D.

(From the *Medical Press and Circular*, Vol. CXIII, 2nd and 9th September, 1936, pp. 189 and 205)

WHEN the statement is made that there is 'albuminuria', the speaker almost always means that one or more of certain qualitative tests on the urine are positive. Actually these are tests not exclusively for albumin, but for urinary proteins as a group. It follows that 'proteinuria' is a better term, and it has the advantage that the user is reminded that further examinations may be required. Accordingly it is logical, first, to describe the routine tests, and then to consider the precautions necessary in their execution. For reasons which will be discussed, it should be an invariable rule to examine microscopically the urinary deposit whenever protein is found. In practice, after these preliminaries, the clinical findings will dictate the next step, if any, to be taken. At this point the combined evidence will often enable a judgment to be made as to the probable source and nature of the protein or proteins in the urine, but in certain cases

further tests will be necessary for their separation and identification, or, it may be, their estimation. In special cases the medical officer will wish to extend his examination by methods for assessing renal efficiency.

Whilst clearly it is necessary to consider the course, nature, separation, identification and estimation of the proteins, this article is concerned primarily with the practical clinical aspects, so that only the simpler techniques will be detailed, though a few references will be given to more elaborate tests, which would be undertaken in a well-equipped laboratory.

It is generally accepted that a simple chemical examination of the urine, including testing for protein, constitutes an essential part of the routine clinical examination of every patient, whether urinary symptoms are present or not. It is the rule before every operation, and for very many applications for life insurance. Clearly, therefore, proteinuria is a subject of wide and genuine importance.

#### ROUTINE QUALITATIVE TESTS FOR PROTEIN

A large number of methods are available for precipitating proteins, as may be appreciated by consulting the textbooks of physiological chemistry, and

it is out of the question in this article to attempt to consider most of them. The writer's selection is based on his experience of those most commonly employed in clinical work, and is limited to three. The boiling and acetic acid test is probably used more than any other; the salicyl-sulphonic acid test has the advantage that no heat is required which is true also for the nitric acid ring test; but the last, though frequently employed, may lead to a number of errors as detailed below.

*The boiling and acetic acid test.*—Urine is poured into a test-tube up to the two-third or three-quarter line. The tube is inclined, and the top half-inch column is boiled by means of a small flame. A precipitate indicates protein or earthy phosphates. A single drop of acetic acid (about 33 per cent) is added and the boiling is repeated, when phosphates re-dissolve, but protein remains undissolved.

Albumin, pseudo-globulin, and eu- or lipid-globulin are coagulated by heat, and mucus may be thrown out on acidification. Bence-Jones' protein may be precipitated with moderate heat, to re-dissolve on boiling, but resolution may be incomplete or not noted, and the protein may be missed altogether if there has been over-acidification (see later).

The initial reaction of the urine is very important and it is a golden rule always to take it with litmus before testing for protein. On heating, carbon dioxide is driven off, and in some cases the resulting shift of reaction towards the alkaline side may bring about a precipitation of earthy phosphates, which are re-dissolved on acidification by acetic acid. The optimum reaction for the precipitation of proteins is slightly acid. If the urine initially is very alkaline—and samples provided for testing fairly commonly are ammoniacal owing to decomposition by bacteria—the boiling may not bring down the protein owing to the formation of alkaline metaprotein. If, however, the boiled mixture is now made just acid to litmus with 33 per cent acetic acid—as much as 5 to 10 drops may be required in some cases—the protein is precipitated, and this may cause surprise. (Metaprotein is insoluble in *neutral or slightly acid* solutions of salts.) This effect of alkaline urine is a practical point, for it may lead to failure to detect proteinuria or to the false conclusion that the 'albuminuria' has cleared up.

Naturally-acid urine is never so acid as to cause failure to detect protein by conversion into acid metaprotein, but it is essential to avoid making the boiled urine grossly acid with acetic acid lest this should happen.

*The salicyl-sulphonic acid test* is performed by adding to 10 to 12 drops (about 0.5 c.c.) of 25 per cent w/v salicyl-sulphonic (sulpho-salicylic) acid to about 5 c.c. (1-in. column in an ordinary test tube of  $\frac{1}{2}$ -in. bore) of urine. Proteins (albumin, globulins, mucus, Bence-Jones' protein, proteoses) give a white precipitate. Whenever there is any doubt as to the existence of a precipitate the treated urine should be compared with untreated urine in another tube held by the side of the first. Another practical aid is to view the two tubes in front of a shaded electric light (e.g., microscope lamp).

Very uncommonly uric acid is precipitated, but is promptly differentiated by warming, when it re-dissolves. Again, the initial urinary reaction is to be remembered, for 0.5 c.c. of the salicyl-sulphonic acid may not be enough for 5 c.c. of urine if the initial reaction be very alkaline. Uroselectan (sodium salt of 5-iodo-2-pyridone-N acetic acid), used for making the urinary tract opaque to x-rays, gives a false positive reaction if administered within the previous six hours. The urine gives a white crystalline precipitate, which may be copious. Differentiation is easy because the precipitate (presumably of the free organic acid) is readily dissolved by adding about two volumes of absolute alcohol and warming.

*Heller's nitric acid ring test* is performed by superimposing about 3 c.c. ( $\frac{1}{2}$ -in. column) of urine on a

similar volume of concentrated nitric acid. A white ring generally indicates protein (albumin, globulins, mucus, Bence-Jones' protein or proteoses), but occasionally may be due to urea nitrate, uric acid, uroselectan, resinous bodies or even bile acids. Urinary pigments or chromogens are oxidized by nitric acid to darker compounds, and when proteinuria is slight the white ring may be obscured by the pigmentation. The protein is changed by the nitric acid into metaprotein, which is insoluble in strong mineral acid.

#### PRECAUTIONS IN EXECUTION OF ABOVE TESTS— CONTAMINATION OF URINE

Proteinuria may result from contamination of the urine in several ways, particularly in women. Gross admixture with menstrual discharge will be suspected from the red colour of the sample, but lesser grades of contamination in the same way, as also access of a vaginal discharge other than that due to the menses, are frequent causes of slight proteinuria in women. They should be considered whenever proteinuria is accompanied by a quantity of squamous epithelial cells in the centrifuged deposit. Careful local cleansing just before micturition usually avoids this difficulty, when the sample is to be examined by chemical means only, but catheterization is generally performed if the bacteriology is also to be studied.

Fæcal contamination of slight degree seldom interferes in testing for protein; the fæces contain varying amounts of mucus, but only gross contamination is likely to cause trouble.

In males contamination with semen is at times responsible for positive tests for protein; the presence of spermatozoa in the centrifuged deposit gives the clue, and in all such cases another sample of urine should be obtained for test purposes.

The urine may be opalescent or turbid from a variety of causes thus making it difficult to decide whether protein is present, if the urine is not first cleared. In practice all such turbid urines should be filtered, and this will remove turbidities due to suspended phosphates, urates, or to gross pyuria, etc., but it will not invariably clear the urine entirely; in that case the residual opalescence is most commonly due to bacteria, and is seldom so marked as to interfere with subsequent testing by the boiling and acetic acid test, or by the salicyl-sulphonic acid test, provided that a comparison tube be employed as recommended. More elaborate means of clarifying the urine are seldom justified in practice owing to their being so time-consuming.

Occasionally deliberate contamination of the urine, e.g., by milk, may be responsible for positive findings, in which case catheterization will be required. At other times, e.g., in life-insurance work, it may be important that the sample be passed in the doctor's presence.

In conclusion, the macroscopical and microscopical examination of any sediment or suspended matter will usually guard against errors due to contamination.

#### MICROSCOPICAL EXAMINATION OF URINARY DEPOSIT ESSENTIAL WHENEVER PROTEINURIA IS FOUND

Positive tests for protein should invariably be followed by an examination under the microscope of the urinary deposit, separated by centrifuging, unless the deposit is macroscopic. The first reason for this rule has already been considered above under the heading of contamination, and is obviously of great importance.

The second reason is that it often aids in the interpretation of the positive results, always, of course, in the light of the clinical findings, and may thus assist in deciding from what part of the urinary tract the protein is coming. Thus presence or absence of casts, erythrocytes, leucocytes and various types of epithelial cells, and the approximate quantities present, all are important in assessing the significance of the proteinuria. Mucus can often be recognized under the microscope. It is therefore essential to consider the morphology of urinary deposits in any practical article on proteinuria.



## THE FINDINGS ON EXAMINING URINARY DEPOSITS

If a deposit is visible to the unaided eye at the bottom of the urinary receiver, a few drops are sucked up into a test-pipette, and one or two are mounted under a cover slip on a slide, and examined directly under the microscope.

In all other cases about 10 c.c. of the well-mixed urine are centrifuged and the supernatant fluid is carefully decanted completely. On righting the tube one or two drops will drain back on to the deposit, with which they are thoroughly mixed by sucking up into the pipette, and then squirting them out repeatedly in order to detach the deposit and obtain an even suspension, which is then mounted and examined.

It is impossible in the space available to give a detailed description of the great variety of urinary deposits, which are described in the books on clinical pathology, physiological chemistry, etc., but an attempt will be made to outline the general principles, together with some practical items from the point of view of proteinuria. It takes years of experience to reach the stage when every constituent of every deposit can be labelled with reasonable certainty, but a much shorter period is sufficient to learn what to look for, and what is important practically.

Deposits may be conveniently classified under four headings: cells, casts, crystals plus amorphous chemical deposits, and miscellaneous.

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Red blood corpuscles are very pale-yellow, homogeneous, biconcave discs of about  $7\mu$  in diameter. They generally lie flat and show a double contour, best seen by carefully focussing up and down. In urine, however, they may be considerably altered in appearance, either becoming swollen eventually to spheres (hypotonic urine), and so losing their double contour, or becoming shrunken or crenated. They are not as refractile as other cells.

White blood corpuscles are a little larger than the average red cell, about 7 to  $10\mu$  in diameter. They are colourless spheres, heterogeneous and granular, and the nucleus may be visible. In urine they may show varying stages of degeneration, and when both degenerated and numerous are often called pus cells.

Epithelial cells vary considerably in size and shape, depending on their site of origin from any part of the urinary tract from the kidneys down to the urinary meatus, or externally. It is important to be able to recognize squamous epithelial cells (see contamination above), but otherwise guesses only can be hazarded as to their origin, because no one type of cell is absolutely characteristic of one particular site. It is true that renal epithelial cells are about the size of leucocytes, roughly polygonal in outline with a well-marked nucleus, but such cells are not invariably derived from the kidney. Cells from the bladder and urethra vary much in appearance and size, depending on whether they are derived from superficial or deeper layers; 'tailed cells' often come from the bladder, but may also originate in the renal pelvis. As a class epithelial cells vary in size (the smallest being of about the diameter of a

leucocyte, the largest being the squamous epithelial cell), vary in shape, are colourless, heterogeneous, often granular and nucleated.

Casts are derived from the renal tubules. Each may be regarded as an internal mould of part of a tubule, and formed by an exudate consisting mainly of protein. When detached and passed down the tract this constitutes the 'hyaline cast' in the urinary deposit. When the inflammatory reaction is more severe the epithelial cells of the tubule are also damaged and detached, and in varying numbers coat, or become embedded into, the surface of the hyaline matrix, so giving 'epithelial casts'. Similarly 'blood casts' are due to the hyaline matrix being coated with varying numbers of red cells. The cells, or possibly the matrix too, often undergo degeneration, giving rise to granules or fatty droplets, and so is formed the 'granular' or 'fatty' cast. As would be expected, all possible intermediate stages between these types are observed, e.g., hyaline, with a few granules, or 'hyalo-granular', granular with an odd epithelial cell recognizable, or 'granulo-epithelial', and so on. Waxy casts are hyaline in appearance, but generally broader, and are fissured; they should not be regarded as necessarily indicative of waxy or amyloid disease of the kidney. Cylindroids look like long narrow hyaline casts, often indeed very long, and are by most authorities regarded as immaterial.

The finding of casts in proteinuria is important in that it points to some at least of the protein as being due to renal damage though the magnitude of the damage must never be hazarded from the urinary findings alone but always after consideration of the clinical findings (see later).

In the miscellaneous group are mucus, spermatozoa (see contamination above), bacteria or yeasts, parasites and foreign bodies. Mucus is present in normal urine in small amounts (see next section), but when in pathological amount it may be responsible, in part or even wholly, for positive reactions with the qualitative tests for protein and in acid urine may be centrifuged down and recognized under the microscope. Its microscopic appearance is difficult to describe but once appreciated recognition is easy; it is in ill-defined smeary streaks or strings.

True bacteria—bacteria in the urine *in vivo*—may or may not be accompanied by proteinuria, depending on the presence or absence of a sufficient grade of inflammation at some point in the urinary tract. In this country parasites (bilharzia, filaria, echinococcus) are a very uncommon cause of albuminuria.

So far no mention has been made of the interesting work of Addis in counting the number of cells and casts in the twelve hours' night urine, because it is too elaborate and time-consuming for routine work. It is mentioned, however, because he does find a certain number of red cells, leucocytes, and even casts in normal urine, and sets a limit for each, above which the finding may be regarded as pathological. Though more accurate and quantitative, Addis's results are not considered to be contradictory to the interpretation given above of the practical rough working method recommended.

## THE SOURCES AND NATURE OF URINARY PROTEINS

Normal urine contains no protein other than a minute trace of mucus, which is present in so small a quantity that it does not give a positive reaction with any of the routine qualitative tests. None the less it may become apparent to the unaided eye when a relatively large volume (e.g., 200 c.c.) of urine is allowed to stand undisturbed by its separation as a light flocculent cloud.

Pathologically, proteins pass into the urine either by exudation (plasma-albumin, plasma-globulin and hæmoglobin inside red cells) or by transudation (plasma-albumin and globulins), or through hæmorrhage greater or less, into some part of the urinary tract (plasma-albumin and globulins, hæmoglobin inside red cells, and in relatively gross hæmorrhages, fibrinogen which yields fibrin). Further, the kidneys will allow to pass



it is out of the question in this article to attempt to consider most of them. The writer's selection is based on his experience of those most commonly employed in clinical work, and is limited to three. The boiling and acetic acid test is probably used more than any other; the salicyl-sulphonic acid test has the advantage that no heat is required which is true also for the nitric acid ring test; but the last, though frequently employed, may lead to a number of errors as detailed below.

*The boiling and acetic acid test.*—Urine is poured into a test-tube up to the two-third or three-quarter line. The tube is inclined, and the top half-inch column is boiled by means of a small flame. A precipitate indicates protein or earthy phosphates. A single drop of acetic acid (about 33 per cent) is added and the boiling is repeated, when phosphates re-dissolve, but protein remains undissolved.

Albumin, pseudo-globulin, and eu- or lipid-globulin are coagulated by heat, and mucus may be thrown out on acidification. Bence-Jones' protein may be precipitated with moderate heat, to re-dissolve on boiling, but resolution may be incomplete or not noted, and the protein may be missed altogether if there has been over-acidification (see later).

The initial reaction of the urine is very important and it is a golden rule always to take it with litmus before testing for protein. On heating, carbon dioxide is driven off, and in some cases the resulting shift of reaction towards the alkaline side may bring about a precipitation of earthy phosphates, which are re-dissolved on acidification by acetic acid. The optimum reaction for the precipitation of proteins is slightly acid. If the urine initially is very alkaline—and samples provided for testing fairly commonly are ammoniacal owing to decomposition by bacteria—the boiling may not bring down the protein owing to the formation of alkaline metaprotein. If, however, the boiled mixture is now made just acid to litmus with 33 per cent acetic acid—as much as 5 to 10 drops may be required in some cases—the protein is precipitated, and this may cause surprise. (Metaprotein is insoluble in *neutral or slightly acid* solutions of salts.) This effect of alkaline urine is a practical point, for it may lead to failure to detect proteinuria or to the false conclusion that the 'albuminuria' has cleared up.

Naturally-acid urine is never so acid as to cause failure to detect protein by conversion into acid metaprotein, but it is essential to avoid making the boiled urine grossly acid with acetic acid lest this should happen.

*The salicyl-sulphonic acid test* is performed by adding to 10 to 12 drops (about 0.5 c.c.) of 25 per cent w/v salicyl-sulphonic (sulpho-salicylic) acid to about 5 c.c. (1-in. column in an ordinary test tube of  $\frac{1}{2}$ -in. bore) of urine. Proteins (albumin, globulins, mucus, Bence-Jones' protein, proteoses) give a white precipitate. Whenever there is any doubt as to the existence of a precipitate the treated urine should be compared with untreated urine in another tube held by the side of the first. Another practical aid is to view the two tubes in front of a shaded electric light (c.g., microscope lamp).

Very uncommonly uric acid is precipitated, but is promptly differentiated by warming, when it re-dissolves. Again, the initial urinary reaction is to be remembered, for 0.5 c.c. of the salicyl-sulphonic acid may not be enough for 5 c.c. of urine if the initial reaction be very alkaline. Uroselectan (sodium salt of 5-iodo-2-pyridone-N acetic acid), used for making the urinary tract opaque to x-rays, gives a false positive reaction if administered within the previous six hours. The urine gives a white crystalline precipitate, which may be copious. Differentiation is easy because the precipitate (presumably of the free organic acid) is readily dissolved by adding about two volumes of absolute alcohol and warming.

*Heller's nitric acid ring test* is performed by superimposing about 3 c.c. ( $\frac{1}{2}$ -in. column) of urine on a

similar volume of concentrated nitric acid. A white ring generally indicates protein (albumin, globulins, mucus, Bence-Jones' protein or proteoses), but occasionally may be due to urea nitrate, uric acid, uroselectan, resinous bodies or even bile acids. Urinary pigments or chromogens are oxidized by nitric acid to darker compounds, and when proteinuria is slight the white ring may be obscured by the pigmentation. The protein is changed by the nitric acid into metaprotein, which is insoluble in strong mineral acid.

#### PRECAUTIONS IN EXECUTION OF ABOVE TESTS— CONTAMINATION OF URINE

Proteinuria may result from contamination of the urine in several ways, particularly in women. Gross admixture with menstrual discharge will be suspected from the red colour of the sample, but lesser grades of contamination in the same way, as also access of a vaginal discharge other than that due to the menses, are frequent causes of slight proteinuria in women. They should be considered whenever proteinuria is accompanied by a quantity of squamous epithelial cells in the centrifuged deposit. Careful local cleansing just before micturition usually avoids this difficulty, when the sample is to be examined by chemical means only, but catheterization is generally performed if the bacteriology is also to be studied.

Fæcal contamination of slight degree seldom interferes in testing for protein; the fæces contain varying amounts of mucus, but only gross contamination is likely to cause trouble.

In males contamination with semen is at times responsible for positive tests for protein; the presence of spermatozoa in the centrifuged deposit gives the clue, and in all such cases another sample of urine should be obtained for test purposes.

The urine may be opalescent or turbid from a variety of causes thus making it difficult to decide whether protein is present, if the urine is not first cleared. In practice all such turbid urines should be filtered, and this will remove turbidities due to suspended phosphates, urates, or to gross pyuria, etc., but it will not invariably clear the urine entirely; in that case the residual opalescence is most commonly due to bacteria, and is seldom so marked as to interfere with subsequent testing by the boiling and acetic acid test, or by the salicyl-sulphonic acid test, provided that a comparison tube be employed as recommended. More elaborate means of clarifying the urine are seldom justified in practice owing to their being so time-consuming.

Occasionally deliberate contamination of the urine, c.g., by milk, may be responsible for positive findings, in which case catheterization will be required. At other times, c.g., in life-insurance work, it may be important that the sample be passed in the doctor's presence.

In conclusion, the macroscopical and microscopical examination of any sediment or suspended matter will usually guard against errors due to contamination.

#### MICROSCOPICAL EXAMINATION OF URINARY DEPOSIT ESSENTIAL WHENEVER PROTEINURIA IS FOUND

Positive tests for protein should invariably be followed by an examination under the microscope of the urinary deposit, separated by centrifuging, unless the deposit is macroscopic. The first reason for this rule has already been considered above under the heading of contamination, and is obviously of great importance.

The second reason is that it often aids in the interpretation of the positive results, always, of course, in the light of the clinical findings, and may thus assist in deciding from what part of the urinary tract the protein is coming. Thus presence or absence of casts, erythrocytes, leucocytes and various types of epithelial cells, and the approximate quantities present, all are important in assessing the significance of the proteinuria. Mucus can often be recognized under the microscope. It is therefore essential to consider the morphology of urinary deposits in any practical article on proteinuria.

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any proteins which normally are absent from or foreign to the plasma, or, as suggested by Bayliss, Kerridge and Russell, which have a lower molecular weight (see below), and therefore presumably (but not necessarily) smaller-sized molecules than the normal blood proteins (hæmoglobin which is free in physical solution in the plasma (hæmoglobinæmia), methæmoglobin (and presumably sulphæmoglobin) when extra-corporeal, Bence-Jones' protein, and proteoses). Likewise the kidneys filter off any protein truly foreign to the circulation but artificially introduced by injection, provided, according to Bayliss *et al.*, its molecular weight is below about 68,000.

Proteins which are excreted	Mol. wt.	Protein not excreted	Mol. wt.
Gelatin ..	35,000	Hæmoglobin ..	68,000
Egg albumin ..	34,500	Serum albumin ..	67,500 *
Bence-Jones' ..	35,500	Serum globulin ..	103,800
† Hæmoglobin ..	68,000	Casein ..	188,000

Mucus, which may be derived from the mucous membrane of any part of the urinary tract, including the prostate, pathologically may pass into the urine in amounts in excess of the normal trace.

Lastly, and very uncommonly, lymph may be added to the urine owing to rupture of an obstructed lymphatic into some part of the urinary tract (chyluria). This must necessarily cause proteinuria owing to the addition of lymph proteins (albumin, globulins, fibrin from fibrinogen, and a few red cells).

#### TESTS FOR INDIVIDUAL PROTEINS

Here only the simple tests and practical points of clinical importance will be considered; the reader is referred to the laboratory textbooks for a fuller account of special tests.

**Albumin** is the most important of the urinary proteins clinically, and commonly is the main protein excreted. To that extent the term 'albuminuria' is justified, but it may be misleading, as already explained, when used as a synonym for a positive qualitative test for protein. Albumin is soluble in distilled water, and is precipitated from urine by full but not by half saturation with ammonium sulphate.

The **globulins** may be divided into at least two groups: pseudo-globulin, which is, and lipid- or eu-globulin which is not, soluble in distilled water. Both are precipitated from urine by half saturation with ammonium sulphate, or by full saturation with magnesium sulphate, or by addition of anhydrous sodium sulphate to 22 per cent (Howe). The insolubility of lipid- or eu-globulin in distilled water or highly diluted urine is of clinical importance (see Roberts' test below, under 'Mucus').

The **albumin-globulin ratio** has been claimed from time to time to be of clinical importance in differentiating the various types of nephritis. Hiller, McIntosh and Van Slyke showed that when all the urine was collected completely for several days and the average daily ratio of albumin to globulin was determined, the different groups of nephritis did show different ratios. Thus in nephrosis, where there is a big proportionate excess of albumin in the urine, the albumin-globulin ratio is high, generally above 10. In amyloid disease, where there is high output of globulin, the albumin-globulin ratio was low (0.5 to 5.0). In acute nephritis, the albumin-globulin was between 5 and 10, and in chronic it is mainly below 5. The practical point emerged, that the ratios often showed large variations from day to day, and that a single determination on (and still more on one isolated specimen of) is quite untrustworthy in differentiation, and misleading. It may be concluded, therefore,

albumin, over 70,000 by osmotic pressure

is near the borderline, and is peculiarly excreted when its concentration in a certain value.

that the albumin-globulin ratio is not a simple test of practical value.

**Hæmoglobin** in the great majority of instances is within the red cells, and not free in physical solution in the urine; hæmaturia is much more common than hæmoglobinuria. Much the best and simplest test for hæmaturia is the microscopical examination of the centrifuged deposit for red cells. The best test for hæmoglobinuria is the spectroscopical examination of the urine cleared by centrifuging (red cells pass through most filter papers to some extent) for the two bands in the green of oxyhæmoglobin; a negative finding should be returned only when a layer three or four inches thick has been viewed, as by placing the direct-vision spectroscope above a test-tube full of urine and looking through the long column, an electric bulb being the light source below.

When hæmaturia exists there must also be proteinuria, for even if the red cells be removed by centrifuging, the supernatant fluid is bound to contain albumin and globulin that has gained access to the urine simultaneously during the hæmorrhage.

In hæmoglobinuria the urine is red, or of a smoky tint, or normal in colour, depending upon the extent. Hæmoglobin is itself a protein, so that in hæmoglobinuria the qualitative tests for protein must be positive. Methæmoglobin, also being a protein, gives positive results with the routine qualitative tests.

**Fibrinuria** is readily recognized from the presence of clots, which, of course, vary in size, depending on the degree of hæmorrhage, so that slight fibrinuria is easily overlooked. The clots are red owing to the entanglement of red cells, except in chyluria, where the cells are usually so few that the clots appear white. The fibrin is easily removed by centrifuging or filtering.

**Mucus**, in pathological quantity, is much more commonly present in urine than is generally recognized. It behaves in its precipitating reactions very much as the globulins, and has generally been included in the globulin fraction in the differential estimation of proteins. It is precipitated by acetic acid in the cold, as also is lipid- or eu-globulin; but mucus is insoluble in excess, whereas eu-globulin is soluble in even the slightest excess of the acid. It is widely believed in clinical medicine that these two proteins are of little or no importance in the sense that one or both are often found in intermittent proteinuria (see later), and that mucus is often due to cystitis or prostatitis, which are evident from the clinical symptoms and examination. In other words, if the proteinuria is due to a protein precipitated by cold acetic acid, there is no need to worry about kidney damage, so the following test has its clinical application.

**Test for proteins precipitated by cold acetic acid.**—About 5 c.c. (1-in. column) of urine in a test-tube are mixed with an equal volume of distilled water, and 33 per cent acetic acid is carefully added drop by drop till the maximum opalescence has been obtained. A pause of about a minute should be made after the addition of each drop, because precipitation is slow. Half the contents are then transferred to a second tube, to which a few more drops of the acid are added. In the first tube a precipitate, which is often slight, may be due to mucus or lipid-globulin, or both. In the second tube a precipitate must be due to mucus only, for lipid-globulin re-dissolves in excess acid. If, therefore, the opacity of the two tubes is the same, mucus alone is present; if the opacity of the first is greater than that of the second, both proteins are present; if the first tube is opaque, but the second is clear, lipid-globulin alone is present.

In the writer's experience mucus alone is the commonest finding.

A second test, which is for lipid-globulin, known as Roberts' test, is performed as follows:—

**Roberts' test for eu- or lipid-globulin.**—A boiling tube (conical receiver or any other convenient vessel) is nearly filled with distilled water, and the urine is added drop by drop. In the presence of eu-globulin a milky haze forms round each drop as it diffuses into

the water. The addition of the drops is continued till the mixed fluid is turbid throughout. Half the contents are then transferred to a second boiling tube. The first tube is left without further treatment for comparison. A single drop only of 33 per cent acetic acid is added to the second tube, when the turbidity clears at once if it be due to eu-globulin.

*Proteoses* may appear in the urine when absorption of partially digested pus is proceeding somewhere in the body, and during involution of the puerperal uterus. They usually occur in traces only, are often transient, and generally are of little or no clinical significance. They are precipitated below 60°C., re-dissolve on boiling, and reappear on cooling. They may be separated from other proteins by coagulation at 60°C., and filtration.

*Bence-Jones' protein* behaves in several ways like a proteose; it, too, comes down below 60°C., re-dissolves on boiling (but see below) and reappears on cooling. It, however, is not a proteose, but a full protein, in character mostly closely allied to a globulin, hence it is better to term it Bence-Jones' protein. Its presence in the urine is practically diagnostic of multiple myelomatosis, though it has been described occasionally in other diseases of the marrow. Although uncommon—it is encountered on the average about once a year in a large general hospital—it is of great clinical importance for very often it is the first sign to establish the diagnosis of the patient's illness. It is, therefore, essential to make clear the evidence on which its detection depends.

In the boiling and acetic acid test it may be noted that a precipitate forms relatively early during the application of heat, to re-dissolve on boiling and reappear on cooling. There are several reasons, however, why this behaviour may be modified or missed. The urine should be naturally acid, or made very slightly so by acetic acid; if it is carelessly overacidified the protein may not be precipitated at any temperature. It may be missed, too, by heating very rapidly. Resolution at boiling point is frequently only partial, though it may be made complete or nearly so by correct adjustment of reaction (*see below under heat test*).

As a preliminary, *Bradshaw's HCl ring test* is useful. It is performed by superimposing a few c.c. of the urine on about 5 c.c. of concentrated HCl. Bence-Jones' protein gives a heavy curdy-white precipitate at the junction of the two fluids. The test remains positive after considerable dilution of the urine (one part with 10 or 20 parts of distilled water), unless the concentration of protein is very low. As a rule the proteinuria is marked when first detected but presumably would have been low in an early stage of the disease. If Bradshaw's test is positive the heat test described below should be carried out, to make sure of the protein, for Bradshaw's test is not specific, because any urine containing an abundance of protein will give a positive result, though commonly only a slight haze. Uroselectan in urine gives a false positive reaction. If Bradshaw's test is negative, further investigation is unnecessary, and therein lies its value as a preliminary.

The *two-tube test* is advantageous when there is doubt as to re-resolution at boiling point. About 10 c.c. of urine are warmed to about 60°C., until the tube is just not too hot to grip firmly in the hand. After inversion over the thumb to insure an even temperature and suspension of the precipitated protein, half the contents are transferred to a second tube, which is thoroughly boiled. Immediate comparison with the first tube demonstrates clearly if there is any resolution, and the degree thereof.

The *heat test* is the most important, and should always be done before diagnosing Bence-Jones' proteinuria. The urine is cleared by filtering, repeatedly if necessary, and the reaction noted. If alkaline, it is made very faintly acid by the cautious addition of 33 per cent acetic acid. About 5 c.c. are placed in each of three test tubes. To the first nothing is added; to the second and third, one and two drops of 33 per cent acetic acid respectively, after which they

are placed together with a thermometer in a beaker of water. The beaker is heated slowly, the water being continuously stirred, and the temperatures at which changes occur noted. In the presence of Bence-Jones' protein the urine becomes turbid below 60°C.—often between 40°C. and 50°C. After a further rise of a few degrees (but still below 60°C.) the precipitate flocculates. Ordinary albumin and globulins do not come down till over 60°C., though in their case also the reaction affects the temperature at which they are first precipitated. On boiling each of the three tubes, one at any rate will show complete or almost complete re-solution (remember, however, that proteins other than Bence-Jones' may also be present). On cooling reappearance of the protein will be evident in one at least of the tubes. Thus a composite picture is obtained of the typical behaviour of Bence-Jones' protein. Three different degrees of acidity, as described, suffice in routine work, but clearly a more elaborate series of tubes with smaller steps in reaction are easily prepared. When the conditions are not correct for complete re-solution at boiling point, it will often be observed that the protein forms a peculiar stringy, sticky, coagulum.

*So-called peptonuria.*—Every now and then when urine is added to Fehling's or Benedict's reagents in the test for 'sugar' it is observed that the mixture in the cold has a deeper blue, or purplish colour, than the original copper reagent. This is often due to the presence of proteins in the urine giving a biuret reaction. But a similar colour change was observed in the absence of proteinuria over fifty years ago (*e.g.*, Ralfe, 1833), and was ascribed to the presence of peptones; when the urine is super-imposed carefully on the reagent a reddish-colour-purple or rose-coloured ring is observed. Godfried has recently studied this phenomenon, and has shown that it is due neither to peptones nor to urobilin (another suggestion), but to a pigment of the urochrome group, or something associated with urochrome. The point is of interest because the practitioner must come across it sooner or later in his routine urinary examinations, but so far as the writer knows it has no clinical significance.

#### QUANTITATIVE ESTIMATION—ITS CLINICAL IMPORTANCE AND TECHNIQUE

It must be admitted that in routine work the physician can obtain all the guidance he requires from qualitative tests, provided that some notation be adopted to indicate roughly the concentration—large, small, or present in traces. As usual, however, such a notation implies more to the observer than to any one else, and whenever observations are to be published they will convey more to the reader if quantitative determinations have been made. Also, in following progress exact estimations are clearly more useful.

A good review of methods available for estimating protein in urine is given by Peters and Van Slyke, 'Quantitative Clinical Chemistry', Vol. II. *Esbach's method* is well known and widely used clinically, but it is important to realize that it is not strictly quantitative, and little importance should be attached to small daily variations as indicated by this means. Unfortunately, the method is rendered still less trustworthy by quite appreciable errors in the calibration of the tubes on the market. The Esbach's tube is cleaned and dried. Urine is run in exactly to the mark U, and Esbach's picric and citric acid solution to the mark R. The tube is sealed with a rubber bung and inverted several times to mix. It is left undisturbed for twenty-four hours, so that the protein precipitate settles by gravity, and the result noted. The readings give directly the grammes of protein per 1,000 c.c. of urine. Knowing the volume of the twenty-four hours' urine, the day's output of protein is calculated.

The following precautions should be observed: If the urine is alkaline it must be acidified with 33 per cent acetic acid; occasionally the original urine is so alkaline that omission of this precaution results in the subsequent precipitation being incomplete. The specific



gravity of the urine is taken with a urinometer; if the specific gravity exceeds 1010 it is diluted accurately with the necessary one or two volumes of water to bring the specific gravity to or below 1010; the diluted urine is run into the Esbach's tube to the mark U, and next day the observed reading is multiplied by the dilution factor; omission of this precaution results in imperfect sedimentation of the protein precipitate.

In *Aufrecht's method* the protein is again precipitated by a solution of picric and citric acid, but the mixture is centrifuged for two minutes at 5,000 revolutions per minute, or for two and a half minutes at 3,000 r.p.m., or for three minutes at 2,000 to 2,500 r.p.m. It is essential to centrifuge for the prescribed time, otherwise gross errors may be introduced. As in Esbach's method, urine is added to U, and reagent to R, but in the specially designed Aufrecht's centrifuge tube, the readings giving the grammes of protein per 100 c.c. of urine. As before, alkaline urines must first be acidified with acetic acid, but the specific gravity is immaterial. Unfortunately the calibration of the tubes on sale is even worse than that of Esbach's tubes, the chief error being in the calibration of the terminal tapered part, so that two Aufrecht's tubes may give absurdly different results, particularly when the protein is less than 0.1 per cent. With a correctly calibrated tube, results can be obtained in a few minutes if a suitable centrifuge is available.

Centrifuging has also been employed in the *method of Shevky and Stafford*; the protein is precipitated by a solution of 1.5 gm. of phosphotungstic, and 5 c.c. of concentrated hydrochloric acid in 100 c.c. of 95 per cent alcohol, in a graduated centrifuge tube: 4 c.c. of urine are treated with 2.5 c.c. of reagent; the tube is closed, inverted slowly three times to mix, and allowed to stand for exactly ten minutes; it is then centrifuged for exactly 10 minutes at 1,800 r.p.m. The volume of the precipitate in c.c. is noted, and multiplied by 0.72 to obtain the grammes of protein per 100 c.c. of urine.

#### THE CLINICAL CONDITIONS IN WHICH PROTEINURIA OCCURS

*General discussion.*—Proteinuria may be one of many clinical signs or may be the only evidence of any abnormality in a subject otherwise normal. It is, of course, simply a matter of words, or of personal choice whether it be stated that normal urine contains no protein other than a trace of mucus, or whether it be stated that the urine of some healthy individuals contains protein which is of no clinical importance. Some cases of glycosuria provide an exact parallel; thus, glycosuria due to true renal glycosuria is of no moment, but until it has been shown conclusively that the condition is renal glycosuria, the urinary finding may be of serious import. Similarly the medical officer must remember that every case of proteinuria needs investigation before he can be satisfied that it is immaterial. The subject is discussed further under 'intermittent proteinuria'.

When there are clinical signs or symptoms in addition to proteinuria, the significance of the proteinuria must be determined in the light of such findings, and upon the conclusions drawn from the whole of the evidence will be inferred what is the probable cause of the proteinuria, and accordingly its course may be predicted. There is no foundation for a separate discussion of the prognosis or treatment of proteinuria or of any other clinical sign. It is the underlying disease or condition responsible for the clinical sign which may require prognosis and treatment.

The compilation of the huge list of all possible diseases and conditions in which proteinuria may occur would clearly be of little or no value, but it is necessary to have some sort of order in thinking of the possible causes and clinical condition when the qualitative tests for protein in the urine have been found to be positive. The writer's practice is to think in anatomical sequence from the exterior inwards, from possible contamination to lesions of the genito-urinary tract in ascending order, and, finally, to the blood and other sources from which the blood may carry protein

to the kidneys. It is obvious that the responsible lesions may be situated in more than one anatomical site, as when both urethra and prostate are involved in gonorrhœa or when both bladder and kidneys are diseased in tuberculosis, and so on, but the anatomical sequence is convenient. The subject will be dealt with in that order now, a few practical points being inserted here and there under the different headings.

*Contamination* as the cause of proteinuria has been considered in the early part of this article.

*Diseases of the external genitalia or of the urethra.*—The venereal diseases, non-specific urethritis, trauma of the urethra, externally or by calculus or gravel, and so on: the heading is sufficient.

*Diseases of the bladder or prostate.*—Cystitis, tuberculosis, vesical calculi and growths, etc. Enlargement of the prostate and its cause. As mentioned above, an excess of mucus in the urine is most commonly due to lesions in this region, and the microscopical examination of the urinary deposit is indispensable. In chyluria, the obstructed lymphatic most commonly ruptures into the bladder.

*Diseases of an ureter or ureters* are uncommon causes of proteinuria, the most frequent among them being stone.

*Diseases of a kidney or kidneys* are generally the first to be considered, and sometimes, unfortunately, are thought of as the only cause of proteinuria; there are many causes of 'albuminuria' in addition to nephritis. The renal lesions may be classified under two headings: (a) kidney diseases proper; (b) secondary disorders of kidneys.

*Kidney diseases proper.*—Trauma; nephritis; tuberculosis; stone; tumour, and so on. Reference to casts and the proportion of albumin to globulin has already been made. The concentration of protein in advanced chronic nephritis may be very small and its detection important; in nephrosis, as a rule, it is high.

*Secondary disorders of kidneys.*—Under this heading are included vasomotor and circulatory disturbances in the kidneys themselves. Thus 'intermittent or benign proteinuria' may be classified here, but is considered in a separate section below, as also is 'proteinuria in pregnancy', many examples of which are due to congestion of the kidneys from pressure by the gravid uterus. Congestion due to a failing heart is in the same category, likewise the circulatory effects in diabetic coma. Proteinuria due to surgical shock, or to cold baths in certain subjects, comes here too. Febrile proteinuria is more difficult to place accurately. In fevers there is undoubtedly a complicating nephritis in a proportion of cases, and this would of course be classed as 'kidney disease proper'. But in much larger proportion of cases the proteinuria is transient and unaccompanied by any clinical signs of renal involvement; some at least of these proteinurias may be regarded as due to renal congestion. In a small proportion of cases, and after scarlet fever in particular, it may be difficult to assess the significance of the proteinuria, which in some instances persists for years; possibly some of these were present before the fever (see also under 'intermittent proteinuria'). Though febrile proteinuria is often classified, together with albuminuria, due to poisoning by chemicals, under the heading of 'toxic', it seems more logical to separate the chemical poisons and to regard their action as definitely productive of renal damage. Experimentally there is clear-cut evidence of this, and clinically the testing of the urine for protein before and after administration is a practical and useful means of detecting damage to the kidneys by such drugs as the organic arsenicals, mercury, antimony, etc., and such proteinuria is an indication for cessation of treatment. In industrial or in deliberate poisoning (arsenic, lead, mercury, etc.), the proteinuria may be significant, as when accompanied by clinical signs of kidney damage, or of uncertain import if there are no such signs, and the urine was not known to be free from protein before exposure to the risk.

*Intermittent proteinuria* is of the greatest practical importance, and produces problems frequently and particularly in insurance work. It is described under a

large number of synonyms, such as orthostatic, lordotic, cyclic, benign, physiological, functional, albuminuria of adolescence, and so on. In the first place contamination of the urine must be excluded (see previous section), for that is often intermittent. Secondly, the subjects of this condition often show signs of cardiac or vasomotor instability, and many are 'weedy', pale, spotty, or overgrown. This type of proteinuria occurs most often at adolescence, but is not limited to that period. Theoretically there might be a slight organic lesion somewhere in the urinary tract which was drained at intervals, and a few patients with intermittent proteinuria have been observed subsequently to suffer from tuberculosis or stone. In a large number, but not all, posture influences the proteinuria. There may be no proteinuria whilst in the horizontal position, followed by varying grades of proteinuria on adopting the exact attitude. It has been suggested that in these individuals there is an imperfect vasomotor control, so that the kidneys become temporarily congested in the upright position. The proteinuria is frequently most marked during about two hours after rising, later becoming less or disappearing, and still later in the day reappearing or intensifying. Lordosis has been noted in some, and has been put forward as a cause of renal congestion, but intermittent proteinuria occurs without lordosis, and *vice versa*. If posture markedly affects its degree, it is a point in favour of the proteinuria being of no importance.

It is generally accepted that ingested proteins are invariably digested and absorbed only as amino-acids, and there is no unequivocal evidence that protein by the mouth, however large the amount, has any influence on the excretion of protein in the urine of man.

Strenuous muscular activity is well recognized as causing or increasing proteinuria intermittently, as in soldiers, athletes, members of rowing crews, etc., but does so only in the minority. Renal congestion may be the explanation, but clearly it is necessary that each case be carefully examined to exclude other and serious causes.

This brings us to the practical point of what evidence should be secured before labelling proteinuria 'benign'. Having made a thorough clinical examination, and having excluded contamination, the fact that the proteinuria is intermittent itself is a strong point in favour of its insignificance, though it has been found that proteinuria may become intermittent in the last stage of a nephritis which is clearing up, particularly after scarlet fever. If it is clearly influenced by posture, that again makes an organic lesion unlikely. To show the effect of posture, the subject is instructed to empty his bladder completely on retiring, and again one or two hours after lying in bed, and these samples are discarded. The specimens passed just before rising, and about two hours later after normal activity in the erect position, are tested. In typical cases the first urine does not, whereas the second does, contain protein, and often in high concentration. Samples later in the day, as previously mentioned, vary in protein content, but quite often the 'albuminuria' disappears after some four to six hours, to reappear later in the evening. An examination of the centrifuged deposit should always be made; all samples containing protein should be so inspected; the method has been discussed in a previous section. An occasional leucocyte, epithelial cell, hyaline cast or cylindroid may be disregarded, but red cells and all other casts should raise the suspicion of the presence of an organic lesion, until repeated and prolonged observations have justified the conclusion that they are immaterial. If it can be shown that the protein is mucus it is not likely to be of importance, but otherwise a study of the nature of the proteins is seldom of practical assistance. Renal efficiency tests are of value to exclude gross lesions, but normal findings with these tests by no means indicate that the kidneys are healthy. One or more should be carried out as a safeguard, but the decision as to whether the proteinuria is benign or indicates a mild organic lesion depends on the other evidence considered above.

*Proteinuria in pregnancy* is very common, and its significance in a particular case often of moment in practice. It has long been recognized that in the great majority of pregnant proteinurics the positive urinary test is of no importance, and is ascribed to congestion of the kidneys due to the pressure of the gravid uterus on the renal vessels. With the modern practice of repeated urinary examinations throughout pregnancy, it has become much easier to assess the significance of the proteinuria: any sudden increase just before term, for instance, and any change in the urinary deposit being revealed.

For a satisfactory study, especially in the last month or so, it is essential to avoid contamination by vaginal discharge by careful cleansing before micturition; catheterization may be required, but is usually unnecessary for purely chemical and cytological examinations and there is no point in running any unnecessary risk of infection.

The chief aims of the tests for protein are the detection of nephritis or other organic renal lesion in a woman who has become pregnant, and to obtain warning of the onset of pregnancy toxæmia, and especially of eclampsia.

*Proteinuria without lesions of the urinary tract.*—Under this heading are included the excretion of foreign proteins introduced by injection, proteosuria, Bence-Jones' proteinuria, and so-called peptonuria. All have been dealt with in previous sections.

## The Use and Abuse of Manipulative Surgery

By A. S. BLUNDELL BANKART, F.R.C.S.

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A FEW weeks ago an elderly lady told me that according to her information manipulative surgery was 'brute force and bloody ignorance'. I told her that this was the best definition I had heard. Perhaps it is significant that in spite of this she entrusted herself to me for manipulation of her spine, showing that some of the more intelligent of the public are able to distinguish between manipulative surgery and the proper use of manipulation in surgery.

I have no wish to quibble about the meaning of a word or a phrase. I have used the term 'manipulative surgery' many times, and once I so far forgot myself as to write a little book with that title. But it is a term to which I have the strongest objection, because it implies or suggests that the use of manipulation is something different and apart from ordinary surgical procedure, and that it is a peculiar method or system of treatment which is no particular concern of the ordinary surgeon or, for that matter, of any surgeon. This is not true; but we may as well admit that not so long ago it was true, or almost true. Manipulation was practised empirically by bone-setters in this country for centuries before its possibilities were realized by the medical profession. In fact, it is little more than twenty years since the conspicuous success of one bone-setter in particular forced the medical profession to take manipulative surgery seriously. Personally, I have never been afraid or ashamed to admit that my own enlightenment came from Herbert Barker—not directly, for I never saw him at work, but from the simple fact that he cured outright a patient of mine whom I had treated unsuccessfully by orthodox methods over a long period.

Many years ago I received a letter from an intelligent middle-aged woman, who wrote as follows:

'Dear Mr. Bankart,

'You may remember that two years ago I consulted you for pain in my feet due to flat-foot. For two years I had your treatment and I did everything that you told me to do. I wore the special boots that you had made for me, and the wedges, pads and supports. I had the massage and I did the exercises which you prescribed for me. But I got no better, and I began



to fear that I should be crippled for life. Then some friends of mine persuaded me to consult Mr. Barker the bone-setter. He, with his wonderful hands, put the bones of my feet back into place, and now, I am thankful to say, I am cured. I have no pain in my feet, I can walk seven miles with ease and comfort, and I feel that a new lease of life has been granted to me.

No doubt your first comment on this case will be that I must have treated this patient very badly, and I entirely agree. But at least I will say that I treated her conscientiously and according to the accepted principles of all the leading orthopaedic surgeons of the day. Yet I had failed, and my patient had gone off to a bone-setter, who had cured her. Perhaps your next comment will be that the universal diagnosis of 'a small bone out of place' is so manifestly false that you are sceptical of cures which are alleged to have been brought about by 'putting small bones back into place'. But you must understand that 'a small bone out of place' is not a diagnosis, but a pretext. The bone-setter must find a reason or an excuse for manipulating a joint, and I must confess that I find it difficult not to take off my hat to the man who first thought of 'a small bone out of place'. Hard things have been said about the medical profession for its tardy recognition of manipulative surgery. But if bone-setters had wished to keep their work to themselves they could hardly have done better than choose a name which is misleading—for whatever else they do they do not set bones—and an explanation of their results which is demonstrably untrue.

#### FOOT STRAIN

In the case of my patient I had no doubt that she was telling the truth, and that, whatever the explanation, she had been cured of her complaint. I asked myself first: What did he do to her, or, for that matter, what could any man do to a foot with his hands alone? The answer was that he could do nothing except move it. How, then, could one man's movement or manipulation differ from that of another, for we had often manipulated feet, but without such dramatic results? The answer was that he could only move it with more force or in a different direction, or both.

So here was the explanation, and surely it is simple enough. It is a story that I have told so many times that I have not the face to weary you with it again in detail. It is enough to repeat that people do not suffer from flat-foot, but from inability to flatten their feet. The great majority of civilized people have acquired some restriction of the natural mobility of their feet, so that they cannot flatten without meeting with the resistance of the soft parts. When the flattening foot meets with this resistance it is strained, and the condition is painful. On the other hand, the completely flat foot is painless. The medical profession and the public have been obsessed with the idea of supporting the arch of the foot. In theory this is ridiculous, for the foot was meant to be an active, supple member, and not a rigid thing like a block of wood; and in practice it has proved a miserable failure. The bone-setter, on the other hand, smashed down the arch of the foot, or, to put it less crudely, he restored its mobility, so that it could flatten without resistance and therefore without pain, and he cured his patients. Most appropriately my experience has led me to mention first the commonest use of manipulation in surgery. For foot strain (not flat-foot, if you please) is one of the commonest ailments of the human body. It may be postural or traumatic in origin. It can be cured by manipulation and in no other way. See to it that you cure it, or others will cure it for you, as they have done in the past.

Now listen to a very different story. Some years ago a doctor brought his son to me with an obviously tuberculous elbow. He had taken him first to a bone-setter (not Barker), who had violently manipulated the joint, and it had flared. The doctor felt and looked a fool; but there it was. No doubt your first comment on this

case will be that the bone-setter ought never to have manipulated this joint, and he knows that as well as you do, now. But how was he to know that this was a tuberculous joint, for he had had no medical or surgical training? Then, you will say, he ought never to manipulate any joint, or, in other words, he ought not to exist. Perhaps you are right; but what about my lady with the supposed flat-foot, and the countless other cases that have been cured by bone-setters after having failed to get relief elsewhere? Do not think that I am talking only of the past. I still hear of orthopaedic surgeons of repute who treat so-called flat-foot with arch supports, who do not recognize sacro-iliac strain, the commonest cause of pain in the back, and who profess to be familiar with manipulative surgery but who seldom practise it. You cannot have it both ways. It is no use saying that the bone-setter ought not to practise because he is not medically qualified unless you, who are medically qualified, are prepared to undertake not merely an occasional manipulation or two, but the whole of the manipulative work that has hitherto been performed by bone-setters. How many of you who are attached to large hospitals have any organized arrangements for dealing with the large number of cases which require manipulation in ordinary orthopaedic practice?

#### SPINAL CONDITIONS REQUIRING MANIPULATION

After the foot, the joints of the pelvis and spine are those which most often call for manipulation in the ordinary course of treatment. I will not inflict the Americanism 'low back pain' upon you. Low back pain is about as intelligent a diagnosis as belly-ache or pain in the chest.

*Sacro-iliac strain* is the commonest cause of persistent pain in the lower part of the back. It is a definite clinical entity, characterized by pain in the sacro-iliac joint, tenderness on pressure over the posterior superior spine of the ilium, a sense of insecurity or weakness, and, in most cases, a normal x-ray picture. Pain may be referred to the outer side or front of the thigh, but never down the sciatic nerve in an uncomplicated case of sacro-iliac strain. Sometimes there is chronic arthritis of this joint associated with a similar condition of the joints of the lumbar spine. Occasionally there is tuberculous disease of the sacro-iliac joint, but this is practically never seen before there is visible evidence of bone destruction in the x-ray picture. So that with the simple precaution of a routine x-ray examination one can diagnose and treat a case of sacro-iliac strain without hesitation. We believe that sacro-iliac strain is a chronic strain or sprain with periarticular adhesions such as may occur in any other joint. Often there is a definite history of injury, and the strain is common after childbirth, but sometimes it is of gradual onset and due to faulty posture. Over 90 per cent of the cases can be cured by manipulation under an anaesthetic followed by massage and exercises. Those which do not respond to manipulation can be cured outright by arthrodesis of the sacro-iliac joint.

*Chronic lumbar back strain* is perhaps the next most common cause of persistent pain in the back. It begins acutely with a sharp stabbing pain during some effort or awkward movement. It is due to rupture of some of the deeper fibres of the erector spinae muscle on one or other side. When the condition becomes chronic there is a point of local tenderness over the erector spinae, spasm of the muscle resulting in limitation of movement, and often a considerable degree of neurosis. Practically all these cases can be cured by manipulation, unless there is an impending claim for compensation or a long-standing traumatic neurasthenia.

*Spinal arthritis*—that is, osteo-arthritis of the lumbosacral and intervertebral joints of the lumbar spine, with or without sciatica—is the third condition of the spine which in suitable cases may be treated by manipulation. We do not pretend to perform a miracle on the permanent osseous changes of advanced chronic arthritis here or in any other part of the body. But do believe that a great deal of the pain of which these

patients complain is due to periarticular fibrosis rather than to actual changes in the joints, and that, if the spine can be made supple again, much of the pain will disappear. Forceful manipulation followed by vigorous massage and exercises is successful in about 50 per cent of these cases. It is irrelevant to add here that, when all other means fail, excision of the corresponding intervertebral joints is an almost certain cure for intractable sciatica.

#### THE KNEE-JOINT

Many people, I think, would say that I should have placed the knee-joint first, or at least second, in the list of those that may require manipulation. But the knee-joint, perhaps, is the one joint which is manipulated more often than it ought to be. Nowhere is the difference between manipulative surgery and the proper use of manipulation in surgery more evident. The practitioner of manipulative surgery alone must manipulate at all costs or confess himself beaten, for he has no alternative methods of treatment. The properly equipped orthopaedic surgeon, on the other hand, has at his disposal all the resources of medicine and surgery, and not the least of these is the use of manipulation in suitable cases.

For many years bone-setters have claimed that they can cure cases of displaced semilunar cartilages by manipulation. It is not true; but here again we have learnt something from the bone-setter. Chronic knee-sprain can be cured by manipulation. In such cases the injury has stopped short of that gross injury which results in a torn cartilage, and has produced instead a sprain of the peripheral attachment of the cartilage. When this condition becomes chronic the patient complains of frequent stabbing pain on the inner side of the knee, occasional attacks of synovitis, and weakness of the joint. He may say that the knee gives way, or slips, or 'goes out', but there is never any mechanical obstruction to movement. These cases are common enough; the symptoms, of course, are due to fibrosis or 'adhesions' at the periphery of the cartilage, and they can be cured by manipulation; and inasmuch as they are usually diagnosed as 'slipped cartilage' by bone-setters and the public, they are largely responsible for the popular belief that displaced semilunar cartilages also can be cured by manipulation.

#### SEMILUNAR CARTILAGE DISPLACEMENT

We now know that a displaced semilunar cartilage is always a torn cartilage, and that when once a considerable part of it is detached and loose the only place it can go to and not give rise to immediate trouble is the centre of the joint. The freeing of a 'locked knee' by manipulation and the further displacement of the detached cartilage into the intercondylar notch may be followed in some cases by a considerable period of immunity. But it is my belief that such a cartilage always gives rise to trouble sooner or later, and that is not what I call a cure.

In the aggregate the surgeons here must have operated upon thousands of semilunar cartilages. In my experience a large proportion of the patients give a history of having put the knee out previously, it may be years before; 'but', they tell one confidently, 'that was put right by a bone-setter'. At operation one finds the typical tear of the cartilage which could not possibly have been 'cured' by any manipulation, although, as I have already said, the manipulation may have been followed by considerable period of immunity from trouble.

That is not the whole story. We see chronic synovitis of the knee passing in patients approaching middle age, who admit that many years ago they 'put a cartilage out, but that was put right by a bone-setter'. These are neglected cartilage injuries, or shall I say, cases in which manipulation has been misapplied. I feel strongly that a semilunar cartilage once torn and displaced in the knee-joint of a reasonably young and healthy individual should be removed forthwith, for if it is left it will ultimately destroy the joint.

You will hardly expect or wish me to recount all the uses and abuses of manipulation in and out of surgery. I think I have said enough to show that manipulative surgery is and must be an integral part of orthopaedic surgery. That it has not always been so I am the first to admit; but we are concerned with the present and the future, and not with the past. Within the last twenty years, for the first time in history, manipulative surgery has been placed upon a sound scientific basis, and we know far more about it now than any bone-setter has ever known. The most striking thing about it is its extreme simplicity. There is no complicated pathology attached to manipulative surgery. The greater part of it is concerned with the simple inflammatory reaction of living tissues to injury—the first thing that we learn when we begin to study medicine—which, in various parts of the body, leads to fibrosis or adhesions in ligaments or muscles, limiting movements of joints, and causing pain when movements are attempted. Manipulation consists merely in moving a joint forcibly through its full range of movement, I would emphasize the point that manipulation in general requires the use of great force, and that the art of manipulation consists of applying great force effectively and safely. Tweaking joints is no part of manipulative surgery.

Frankly, I do not think that the bone-setter abused manipulation so much as some people would like to make out. The genuine British bone-setter, now almost a figure of the past, was for the most part an honest fellow, who did work which nobody else would do, and believed in his work and was largely justified in his belief by the results he obtained. Being entirely without medical or surgical training he could not make an exact diagnosis, and it is not surprising that occasionally he met with disaster. But that, I am charitable enough to believe, was his misfortune rather than his fault.

#### OSTEOPATHY AND CHIROPRACTIC

I should like to stop now; but no account of the abuse of manipulative surgery would be complete without some mention of those American stunts which go by the names of osteopathy and chiropractic. It is little more than sixty years since an obscure American physician called Still announced that it had been revealed to him by God that practically all diseases are due to slight displacements of the spine, which produce pressure on the blood vessels in the intervertebral foramina, and so cause disease in various parts of the body. He devised a series of manipulations which had for their avowed object of replacement or 'adjustment' of these so-called spinal lesions; by these manipulations, it was claimed, the pressure on the blood vessels was relieved, and the diseases resulting therefrom were cured. He called this treatment osteopathy, and osteopathy it is.

Do not let anyone deceive you by explaining that this is ancient history, and that the 'modern osteopath'—whatever that may mean—is a more enlightened fellow who has become, in fact, a 'manipulative surgeon'. This is not true. It is true that the osteopath has shifted his ground again and again as one after another of his claims has been shown to be absolutely devoid of any scientific foundation. Pressure on the blood vessels in the intervertebral foramina gave way to 'congestion', and then to 'interference with the autonomic nervous system', and latterly an attempt has been made to identify the imaginary 'osteopathic lesion' with the chronic back strain which we know so well. In treatment, too, the osteopath has shifted or extended his ground in that he may employ local treatment in addition to, but not as a substitute for, the spinal 'adjustments' which are the essential basis of osteopathic treatment. I need hardly remind you of the impudent attempt which was made a year ago to establish by law a virtual monopoly of manipulative surgery for osteopaths in this country. Osteopathy has nothing whatever to do with manipulative surgery. It is an American 'stunt' based on the unsupported

assertion that practically all diseases are due to imaginary displacements of the spine. It has been investigated up to the hilt, and it has been found wanting.

About twenty years after Still, another obscure American called Palmer, without any medical qualifications, announced that he had made the 'discovery' that 95 per cent of all diseases are due, not to pressure on the blood vessels at all, but to pressure on the nerves of the intervertebral foramina, brought about by the same imaginary displacements or 'lesions' of the spine. He employed manipulations similar to those of Still, but he called his system of treatment chiropractic. This rival venture proved even more successful than its prototype, judging from the fact that there are far more chiropractors than osteopaths in the United States and Canada. There is little to choose between them, but it is the osteopaths particularly, with their more pretentious claims, who have tried to establish themselves in this country. It is up to orthopaedic surgeons to see that these confidence tricks are exposed, and to ensure that the proper use of manipulation in surgery is taught and practised in all our teaching hospitals.

## Treatment of Chronic Rheumatism

By H. LETHEBY TIDY, M.D., F.R.C.P.

(From the *British Medical Journal*, Vol. II, 29th August, 1936, p. 418)

I SHALL assume that there are three clinical groups included in the term 'chronic rheumatism'—namely, rheumatoid arthritis, osteo-arthritis, and fibrositis. I shall also assume that the term does not include acute rheumatic fever, or arthritis associated with specific infections such as gonorrhoea, or associated with gout, organic nervous diseases, or with certain other obvious factors such as hæmophilia. I shall not further define the subject of our discussion, and shall proceed to review the various methods of treatment which are available.

### PRESENCE OF A SEPTIC FOCUS

All cases should be carefully examined for a septic focus, and when such is found it should receive the appropriate treatment. The opinion of the dental surgeon should be followed, but indiscriminate extraction of teeth, which is usually contrary to his advice, should be discouraged. These steps constitute the routine procedure in the treatment of most chronic conditions. But I do not agree with those who consider there is sufficient evidence for the view that bacterial action is the invariable cause of chronic rheumatism, and, in the absence of anything more definite, will accept as the cause some organism which is isolated from the stools and possesses slightly irregular sugar reactions.

**Vaccines.**—Those who hold that vaccine therapy is the correct treatment for chronic sepsis are justified in employing it when a definite focus is identified. But there is no justification for the routine use of vaccines in chronic rheumatism. We know that sepsis will disturb a diabetic regime, but it is not suggested that vaccines are a treatment for diabetes. No evidence that is satisfactory, or even nearly satisfactory, has been produced in support of the use of vaccines in chronic rheumatism within the definition of our discussion. It is particularly illogical to employ in chronic rheumatism irregular methods of vaccine therapy which have no support in general use.

### DRUGS AND DIET

Analgesics such as aspirin may relieve aching, especially in fibrositis, though failure is frequent. Many an osteo-arthritic has faith in iodine and in 'Chelsea pensioner' for easing pain. Gold is the only drug for which a specific effect can be claimed, and its use is limited to rheumatoid arthritis. Its introduction is due

to the French view that rheumatoid arthritis is tuberculous in origin, a theory which is not accepted in this country.

I have seen several cases in which there was undoubted improvement during a course of gold injections. But results are difficult to evaluate in a condition which is liable to exacerbations and remissions, and further study is necessary before its value can be accepted as established. There is a distinct risk of producing a serious form of dermatitis by its use. During a course of gold injections the local care of the joints must not be omitted.

Chronic rheumatism may develop in association with or at an age when hypothyroidism is common and the general condition will benefit from the administration of thyroid, but there is no reason to ascribe any specific action to thyroid. With regard to hyperthyroidism, Dr. Gardiner-Hill has examined extensive material and finds no evidence that it is associated with any type of chronic rheumatism.

Local treatment with drugs is almost confined to the analgesic action of methyl salicylate in rheumatoid arthritis, to Scott's dressing in osteo-arthritis, and to other similar measures. In certain types of fibrositis pain may be relieved by injections of saline or of such substances as quinine urea hydrochloride.

**Diet.**—There are few principles of any value, in spite of the firm belief of the public in a diet chart. The diet should be well-balanced and contain a sufficiency of vitamin. Patients with rheumatoid arthritis are often thin, and fat appears to be indicated, but increase in weight is more often associated with a remission of symptoms than attributable to the diet. In obese osteo-arthritic subjects weight should be reduced by systematic dieting. Sufferers from fibrositis know that an attack will be precipitated by special articles of diet, such as malt liquors.

### LOCAL AND PHYSICAL TREATMENT

In rheumatoid arthritis absolute rest in bed is essential while there is pyrexia and the joints present the appearance of acute inflammation. Vincent Coates' phrase may be recalled: 'The treatment of every case is orthopaedic from the start'. The object is to prevent or control the development of deformities and adhesions. The joints must be placed in splints and in the positions opposed to those deformities which are known to develop. The splint must be taken away and each joint moved daily. The object of this is to prevent adhesions and not for the benefit of the muscles. A single movement in each direction is thus sufficient, and the repetition which is often encouraged is inadvisable. It is essential that the joint should not bear weight during the movement, nor indeed should an inflamed joint bear weight at any time. Active movement is better than passive, especially if contractures have already developed, since it is less apt to cause injury to the joint in the early stages of treatment.

Heat is indicated in all forms of chronic rheumatism. It tends to relieve pain and stiffness of the muscles, to improve the capillary circulation, and to promote the resolution of inflammation and effusions. It may be applied locally or by electrical and balneological methods. For rheumatoid arthritis radiant heat lamps are the simplest method.

Massage is a valuable part of treatment in most forms of chronic rheumatism. It is especially helpful in fibrositis, as it assists in dispensing nodules and adhesions in muscles and deep tissues before these become organized. It also improves circulation and muscular tone, and thus is of value when muscles are tending to waste and atrophy, but it cannot affect adhesions involving joint tissues.

### MOVEMENTS

Movements exercise the muscles and militate against adhesions and diminished mobility of joints. They are an integral part of the treatment of practically all types of chronic rheumatism at some stage. It should be

emphasized that no joint should be moved while it is bearing weight, or at least that the weight should be reduced to a minimum. In osteo-arthritis movements are best employed in conjunction with balneotherapy. If pain comes on during movements or exercise it is evident that the movements have been excessive, and the same is probably true of pain developing at night. But pain on movement after a joint has been at rest is no contra-indication to the use of movement in treatment.

Massage, movements, and all methods of physical treatment and balneotherapy should be under the direction and sufficient supervision of a medical man. There can be little doubt that the degree of massage, for example, is at times excessive. Unfortunately few medical men have the necessary knowledge and training, a defect which, it is hoped, will be reminded in the next medical generation.

#### ELECTRICAL TREATMENT AND RADIATION

There are numerous methods of administering electrical treatment and radiation. Many are convenient for applying heat, with the undeniable result of relieving pain, though unfortunately, this is often only temporary: such is the effect of radiant heat or electric light in rheumatoid arthritis or infra-red light in osteo-arthritis. Diathermy heats the deep tissues, but it may be doubted if it has any advantage over other methods except in rapidity and for osteo-arthritis of the hip. It is not devoid of undesirable after-effects, and its value has been over-estimated; indeed, exaggerated claims have been made for the results of many methods. I can find no satisfactory evidence of any benefit from ionization or deep x-ray therapy.

The faradic current is of great value in the intramuscular forms of fibrositis, the muscular contractions produced dispersing and removing nodules and adhesions. It also aids the control of muscular wasting in all forms of chronic rheumatism.

#### BALNEOTHERAPY, MINERAL WATERS AND SPA TREATMENT

The value of treatment at spas has been recognized almost from the beginning of history. For many hundreds of years a spa depended on the reputation of its 'cures', and no attempt was made to explain how the waters or medium acted.

About eighty years ago lengthy analyses of spa waters began to appear, patients being left to draw their own conclusions. Later, the results of much so-called research were published, few of them fulfilling the canons of scientific evidence and research. The aim appears to be to prove that the good results of a certain spa are due to the presence of some substance or quality in its waters which is absent from the waters of other spas. The unprejudiced observer can feel little doubt that many spas with widely different waters and surroundings produce approximately similar results. Unless something more definite, or, alternatively something common to many spas, can be produced with scientific support, the profession and public may decide that the various claims cancel out, and that the maximum benefit from treatment can be obtained without visiting a spa.

#### EXTERNAL USES OF SPA WATERS

There is no evidence that there is any appreciable absorption by the skin of the ingredients of any medium used for 'baths', either water, peat, or other varieties of mud. Those who claim that the result of any balneological or spa treatment is due to such absorption have the burden of proof laid on them.

Beneficial results, therefore, depend on physical qualities and effects, such as temperature, specific gravity, consistency, and percussion. The action may be, first, mechanical. The weight on the joints is reduced and movements of weakened muscles are thus aided. This is a very important action. Secondly, it may be thermal. A warm medium will raise the temperature of the skin and increase the rate of peripheral circulation. Together with the mechanical action, this may greatly relieve pain and at the same time assist

movement. Peat and mud baths combine mechanical and thermal effects to a greater extent than water, and the deep mud pools are of special value in osteo-arthritis and fibrositis. A cold medium is stimulating, as everyone appreciates from sea-bathing, but it has little part in the treatment of chronic rheumatism.

Thirdly, there is the percussion effect. This may combine the good results of heat, massage, and movements, as is shown in whirlpool baths. The same result may be achieved by the massage douche, performed with various types of needle baths and jet douches. The physical action may have some physiological effects on the kidney and cardiovascular system, but there is little evidence that balneological treatment directed against chronic rheumatism achieves appreciable results of this kind, and exaggerated claims have often been made in the past.

The effects here described are those of balneotherapy, and the treatment can be made available anywhere. In the past such substitutes for spas have too often been incomplete and on the unsatisfactory basis, by reason of the large financial outlay involved, but there is no reason why they should continue to be so.

All spa and most balneological treatment is influenced by the length of time devoted to it. Patients desire the maximum effect in the minimum of time and look for intensive treatment. They would possibly do better if they arrived at the maximum effect in the maximum time, but duration is largely controlled by the purse and by opportunity, and partly by the mental outlook of the patient. Experience has led to general agreement that a course of treatment should not exceed a few weeks, and that longer periods cause debility. But the course can be repeated after an interval.

The question of the value of the internal use of spa and medicinal waters is a thorny one. Reports of so-called researches, often widely disseminated through the post, have in the past been little more than advertising propaganda. So far as chronic rheumatism is concerned, there is at present no satisfactory evidence of any special beneficial effect, even in the presence of radio-activity. Of course the general health of many individuals will benefit from a period under a regulated regime.

*Indications and contra-indications.*—Balneotherapy and spa treatment for chronic rheumatism are contra-indicated in advanced diseases of the heart, lungs, and kidneys, and in all conditions of severe debility. In rheumatoid arthritis simple hot-water baths aid movements at joints help to relieve pain, but other balneological treatment in general is contra-indicated. Balneotherapy is of special value in osteo-arthritis and in the intramuscular forms of fibrositis.

### The Importance and Advantages of Prescription Writing in Medical Practice

By E. FULLERTON COOK, Ph.M.

(Abstracted from the *Journal of the American Medical Association*, Vol. 107, 19th September, 1936, p. 965)

#### A PRESCRIPTION SHOULD BE DISTINCTIVE

WHILE the ideal of medical practice is to use a single therapeutic agent of known physiologic value, it is often advisable to employ a suitable vehicle and to vary this so that the medicine may be distinctive. This applies to all forms of medication, such as liquids, powders, capsules and ointments. A pleasant flavour, an odour that suggests something other than a medicine, an added colour are all legitimate enhancements to a prescription and make the medicine less likely to be duplicated. Those who deal with the sick are conscious of the influence of suggestion; a belief in the physician and his treatment is a powerful influence for relief and cure.

#### ADVANTAGE OF CO-OPERATION BETWEEN THE PHYSICIAN AND THE PHARMACIST

If the physician in practice is unfamiliar with suitable flavours, colours and vehicles, he has a tendency to order ready-made preparations rather than to write, a

prescription containing the ingredients desired. Other factors that sometimes lead to 'ordering' in place of 'prescribing' are complexity of the pharmaceutical problem involved or lack of information as to dosage, solubility, chemical reactions and other factors.

In these strictly pharmaceutical problems the skilled pharmacist can often help the physician. He can also supply information concerning manufactured medicines, and co-operation with a competent pharmacist will frequently prove beneficial to the patient.

The intensive training of the physician and the elaborate machinery for preparing, standardizing, checking and distributing medicinal substances are all animated by the needs of a patient. To meet this situation there comes the physician, skilled in diagnosis, familiar with the most effective methods of treatment and having at his command a knowledge of the action of medicinal substances and knowing when they are indicated. But his medical skill frequently cannot function effectively if there are not available the carefully prepared and standardized ingredients for his prescriptions, already produced by expert pharmacists, chemists, bacteriologists or biologists, and made available through the pharmacist in the hospital or the community.

#### IMPORTANCE OF THE SCIENTIFICALLY CONTROLLED MANUFACTURING LABORATORY

In the background there must stand to-day the manufacturing laboratories, with efficient equipment and rigid control over every step of manufacture. These must produce standard inorganic and organic chemicals, such as ether, potassium iodide and sodium salicylate, complex synthetics such as arsphenamine, biologicals such as diphtheria antitoxin and rabies vaccine, biologically standardized pharmaceuticals, including preparations of digitalis and pituitary, sterile products for parenteral administration and the hundreds of other needed chemicals and pharmaceuticals.

The trained pharmacist serves as a liaison officer in the hospital, the medical centre and the community. His specialized knowledge concerning the available medicines should be of inestimable value to the physician in both the selection of medicines and their combination.

#### THE PRESCRIPTION FOR THE INDIVIDUAL

The prescription written for the individual patient is an important link in a perfected service. An original prescription shows evidence of professional skill and is not a product with which the patient is already familiar through its display in the type of medicine store where no professional knowledge is present and where such standards must necessarily be low.

The latter situation is worthy of serious consideration, for the patient is likely to question the justification for a doctor's fee when it results in what may appear to be a 'patent medicine' type of treatment. Physicians are also realizing that the patient is almost certain to recount his or her experience when talking to friends, perhaps to the discredit of the doctor. Even the naming of such trademarked medicines under these circumstances often leads those who hear the discussion to buy the same medicine to relieve self-diagnosed symptoms. The alarming increase in the use of hypnotics, without medical advice, illustrates this danger.

The use of abbreviated official titles written into a prescription and with a 'non rep.' order controls the situation, while the suggestion to 'buy it at the drug store' opens wide the door to self-medication.

#### OFFICIAL MEDICINES NOW LARGELY USED

In proposing the use of official medicines on prescriptions it is not being suggested to physicians that they seriously modify the present-day custom of most doctors. In a scientifically conducted survey of the actual ingredients used by physicians in their prescriptions during 1931-1932, a study covering typical communities throughout the United States and including 121,294 prescriptions, Gathercoal reported that 65.19 per cent of the ingredients in these prescriptions were

official in the U. S. P. X, 7.92 per cent were in the National Formulary, 16.05 per cent were proprietary specialties and 10.84 per cent were unofficial items. About the same time the author of this paper found by a study of the catalogues of physicians supply houses that a preponderant proportion of the ingredients used in their formulas were official in the U. S. P.

The Pharmacopœia of the United States was founded by physicians in 1820 as a therapeutic guide to the profession. It has endeavoured to maintain that position for more than a hundred years. Its preparations were the basis for the teaching of therapeutics in medical schools for almost a century and now they constitute the large majority of those therapeutic agents recommended by the American Medical Association in *Useful Drugs* as a present-day therapeutic guide for medical schools.

#### PHYSICIANS AND THE PHARMACOPŒIA

The Pharmacopœia invites the physicians of the country to assist in maintaining it as a reliable guide to the medical profession in the field of therapeutics. If items now official are unreliable they should be deleted; as important new remedies are developed these should find a place in the Pharmacopœia by 'interim revision'.

It is believed that, with a study of the ingredients official in the new Pharmacopœia, especially when supplemented by the National Formulary tablets, ampules and elixirs of U. S. P. drugs, including such preparations as Elixirs of the Bromides, of Barbitol, Phenobarbital and Aminopyrine respectively, and the Sprays and Jelly of Ephedrine, physicians will find a wide range of medicines for practically every therapeutic need.

#### OFFICIAL MEDICINES IN HOSPITAL TREATMENT

Emphasis should also be placed on the restriction of routine hospital treatment to official medicines whenever possible, since this has been demonstrated to be a policy which is scientifically and economically sound.

#### PRESCRIPTION WRITING BY HOSPITAL INTERNS

This programme for the hospital has within it another possibility of far-reaching significance. It is realized that the medical student has little opportunity in his crowded curriculum to become familiar with official titles or even to gain practice in prescription writing. Insufficient information and training in these two fields as well as the use of certain types of hospital formularies and lack of co-operation between the house and visiting medical staffs help to explain the failure to write more prescriptions for official medicines. This is being recognized by a number of hospitals, and both medical and surgical interns are being given regular training in the use of official medicines and in prescription writing. The appreciative response, where this course has been well conducted, is gratifying and is apparently justifying itself by the increased efficiency and ability of the younger physicians having this added training. The medical staffs of many hospitals have developed their own 'formulary' as an aid in the efficient and economic use of medicines within the hospital. The prescriptions in such a 'formulary' should never be given by numbers, as this practice has led to both carelessness and mistakes. In the coupling of such a 'formulary' the official titles of drugs, chemicals or preparations, or their official abbreviations, should be used so that the younger physicians on the staff may become increasingly familiar with these established medicines.

#### THE PRICE OF A PRESCRIPTION

The price of a prescription is no small item for consideration in the total cost of medical care. It should be the basis for a complete understanding and must be established on a sound and economically correct foundation.

It is proper that the patient should pay for the medicine and that it should not come out of the physician's fee, for that is not economically sound and



leads to numerous abuses. Many physicians to-day are being persuaded to start the practice of office dispensing. There are conditions in which this is justified, as in a country district where there are no prescription-filling facilities; but that it introduces the possibility of many complications must be conceded, and most physicians return to prescription writing as soon as financial pressure is relieved.

However, to return to the price to be charged for the prescription: when the pharmacist is called on to utilize his professional skill and equipment in supplying the medicine ordered by the physician or when he has prepared the medicines beforehand in his laboratory, using his training and equipment, there is justification for including a reasonable professional fee in the price to be charged the patient.

#### THE REFILLING OF PRESCRIPTIONS AND THE GIVING OF COPIES

An argument sometimes advanced against the writing of prescriptions is based on the belief that the patient often continues the use of the medicine long after it was intended by the physician by having the original prescription refilled and by even giving copies of the prescription to friends.

If a physician prefers that the prescription shall not be refilled except on his order, it is the common practice to add to the prescription the abbreviation 'non rep.' and his injunction will be honoured by the pharmacist.

This 'non rep.' order should never be printed on a blank prescription. It has a different significance when written on the prescription by the physician. The pharmacist can assist by attaching a special label to the filled prescription indicating that it is nonrefillable. In such cases 'a copy' of the ingredients should not be placed on the package.

#### SUMMARY

The welfare of the patient is often aided by the administration of a properly selected medicine. A distinctive prescription, written for the needs of a specific patient and using official drugs or preparations whenever these are available, is desirable.

The skilled professional pharmacist can often be helpful in the selection and combination of medicines.

The judicial use of the 'non rep.' order on prescriptions and the employment of official titles will assist in the control of objectionable self-medication.

## Reviews

**A SYNOPSIS OF HYGIENE.**—By W. W. Jameson, M.A., M.D. (Aberd.), F.R.C.P., D.P.H., and G. S. Parkinson, D.S.O., M.R.C.S., L.R.C.P., D.P.H., Lieutenant-Colonel, R.A.M.C. (Retd.). With a Section on Personal Hygiene. By G. P. Crowden, M.Sc., M.R.C.S., L.R.C.P. Fifth Edition. 1936. J. and A. Churchill, Limited, London. Pp. viii plus 623, with 17 illustrations. Price, 21s.

The general excellence of Jameson and Parkinson's *Synopsis of Hygiene* is better shown by the fact that a new edition is called for every two or three years, and that it has now reached its fifth edition, than by anything that the reviewer can say about it. It remains for him to endorse the general opinion and to indicate the general scope of the book and the extent to which it should be of value to those working under Indian conditions, instead of the English conditions for which it is primarily written.

The book is a synopsis of all those subjects, excepting bacteriology and chemistry, studied during a course for the Diploma in Public Health. It is not possible to put more than a synopsis of nine months' work into one volume, but the authors have made this volume of great value as a general textbook by documenting it fully with references to official and other publications with which the reader can fill in the very solid outline they provide. In most similar textbooks it is usual to find the main emphasis laid on such routine matters as food inspection, provision of water supplies, removal of refuse, with a minor emphasis on the epidemiology of disease. In the book under review the epidemiology and control of disease, the causation and prevention of maternal and infantile mortality, and the essentials of healthy living in the form of food, clothing and personal hygiene, warmth, light and air are the main interest of the authors; it is their treatment of these subjects which puts their work far in advance of others. They deal fully with the routine duties of a medical officer of health, but it is a pleasure to see these in their proper perspective as a means to an end rather than as an end in themselves.

All those conditions which a medical officer of health in India might be expected to meet are dealt with in this volume, accurately and with sufficient references to original sources to enable the student to elaborate his knowledge, but it is natural that those which are principally tropical should be less fully described than those which are principally found in temperate countries. Most diseased conditions are both tropical and temperate, their incidence differing only in degree,

and the work should therefore be invaluable in India, but it should be regarded as an invaluable addition to, and not a substitute for, a training in tropical hygiene. There must be few medical officers engaged in public health practice who can afford to dispense with its help.

The chapter on public health law, which includes the Consolidating Public Health Act passed only a few months ago, gives a very full and clear account of the state of the law in England and is an almost essential guide to anyone wishing to understand it. To the worker in India this chapter is mainly of interest as an indication of the general lines along which we may hope to direct public health law in India when it is fully realized how necessary a legal backing is to any effort to improve the public health.

G. M.

**ENDOCRINOLOGY IN MODERN PRACTICE.**—By William Wolf, M.D., M.S., Ph.D. 1936. W. B. Saunders Company, Philadelphia and London. Pp. 1018, with 252 figures. Price, 42s.

Or the many contributions made during recent years to our knowledge of medicine, perhaps the most significant are those pertaining to the domain of endocrinology. The physiology and biology of the glands of internal secretion are now better understood, the chemical nature of the hormones is better recognized, and active extracts or pure principles have been isolated from many of them. The various diseases or symptom complexes associated with dysfunction of one or more of these glands can therefore be studied with much more precision than was possible at the beginning of this century. The literature on the subject however is so vast that it is difficult even for the specialist or the research student to keep abreast of all useful information. Dr. Wolf's book is an attempt to present the clinical phase of endocrinology in a 'comprehensive and authoritative manner, yet free from burdensome, technical and theoretical considerations'. The author is to be congratulated on what he has achieved.

The book has been divided into three major sections. The first section deals with the anatomy, physiology and biology of the glands; this is followed by a description of the disease entities in a manner and sequence most likely to be met by the physician during the course of his practice. In the second section is set forth the endocrine aspects of 'non-endocrine' diseases and the third part is taken up with the procedure and methods to be followed in the diagnosis of the various endocrinopathies. The various theories and hypotheses



are not presented with a bias, but sympathetically and stimulatingly. A very useful feature is the introduction of summaries of the whole subject in a tabular form at the end of each chapter. This facilitates rapid review of the salient points. Not less important for the everyday practitioner is the chapter on commercially available endocrine products and the treatment of the various endocrine disorders; the author appears to be generally optimistic and has shown a good deal of reliance on 'substitution therapy'. In view of the too frequent disappointments encountered, many practitioners treating such conditions would not be in agreement with the author on certain points in this regard.

The book is full of pertinent information on the subject. The remarkably lucid presentation keeps the enormous number of items correlated in an almost perfect unit and the student is properly orientated at all times. The book is worthy of the attention of all interested in endocrinology in modern practice.

R. N. C.

**A TEXTBOOK OF SURGERY.**—By John Homans, M.D. Fourth Edition. 1936. Charles C. Thomas, Springfield, Illinois, U. S. A. Pp. x plus 1267. Illustrated. Price, \$8.00

THE opinion of a consulting physician would probably be that this work raises surgery to the dignity of medicine, and indeed, in interest, literary style and soundness of doctrine it deserves to rank with the classics. The illustrations, mostly by Willard C. Shepard, remind one of the beautiful woodcuts in Bland-Sutton's books, and are enlivened by occasional bright sketches of the way in which certain accidents happen. The publishers are evidently proud of their handiwork, for a quaint little notice gives technical details of the paper, printing and binding.

In the orthodox way, chapters on general principles are followed by regional descriptions, and a very pleasing feature is the inclusion, at the beginning of each chapter, of a short historical note, which whets the reader's appetite for the heavier, but always attractive and digestible, fare to come.

New matter includes an excellent chapter on the sympathetic nervous system, which is pleasantly cautious, and among other things points out that pre-sacral neurectomy for megacolon in boys may render them impotent later, while the chapter on amputations and plastics is a model of well-reasoned soundness. The chapters on the central nervous system are some of the best in this, or in any book, and in them one detects the master hand of Harvey Cushing. Certain other sections might be brought more up to date, for instance, in the article on cleft palate there is no mention of post-Langenbeck operators such as Veau and Wardill, and the hormone treatment of undescended testicle and chronic interstitial (cystic) mastitis is not referred to. The treatment of fractures might be described as bloodless with a Böhler influence, and, although bone-plating is not mentioned, many English and Indian surgeons feel that the method has its uses.

All the information required in a first-class textbook is given, but given with such charm and humanity that the student hardly realizes he is learning, so learns all the better, for this is no full catalogue of facts and methods, but a real attempt to make the reader into something nobler than a mere licensed craftsman, and to give him that true insight into the cause of things without which he cannot hope to cure them.

H. W.

**AN INTRODUCTION TO SURGERY.**—By R. Morison, M.D., F.R.C.S. (Edn.), F.R.C.S. (Eng.), M.A., D.C.L., LL.D., and C. F. M. Saint, C.B.E., M.D., M.S., F.R.C.S., F.R.A.C.S. 1935. John Wright and Sons Limited, Bristol. Pp. ix plus 367. Illustrated. Price, 15s.

It was a pleasure to find this book to be really what its title implied and not another addition to the

plethora of cram books which already exist on the subject.

No attempt has been made to achieve completeness nor to furnish academic detail; the aim is to introduce the atmosphere and general principles of surgery to the student and to encourage him to think out his problems. The text is written in an easy yet impressive style and is augmented where emphasis is necessary by accounts of personal cases and by well-reproduced illustrations.

The student commencing his clinical work would be well repaid if he were to study this book. He would get a foundation for his future study which the heavy standard works do not attempt to supply yet, which is so important for his proper appreciation of the subject.

J. C. D.

**HANDBOOK OF SURGERY.**—By E. C. McKie, M.B., Ch.B., F.R.C.S. (Edn.). 1936. E. and S. Livingstone, Edinburgh. Pp. xii plus 699. Illustrated. Available from Messrs. Butterworth and Company (India), Limited (Publishers), Calcutta. Price, Rs. 9-6

THIS is a book offering the student and post-graduate a means of quick revision of the whole subject of surgery within a small compass. Excess of detail has been avoided and the information given is accurate, if not very full. The writer has succeeded in avoiding the tabular type of presentation so familiar in other cram books, and has made his text quite readable.

As the arrangement is the classical one, the book could be used in conjunction with any of the larger works. Such a practice is, however, of doubtful value. It would be better to restrict the use of books of this type to rapid last-minute revision.

J. C. D.

**ROENTGEN INTERPRETATION. A MANUAL FOR STUDENTS AND PRACTITIONERS.**—By G. W. Holmes, M.D., and H. E. Ruggles, M.D. Fifth Edition. 1936. Henry Kimpton, London. Pp. 356. Illustrated with 243 engravings. Price, 22s. 6d.

THE authors have found it necessary to produce a fifth edition of this small book on radiological diagnosis so it must be in fairly constant demand.

The first chapter is devoted to shadows caused by various superimposed bodies, such as those in the clothes, also calcifications, deposits of metallic salts and other causes of shadows that may lead one astray, and the second chapter deals with anatomical variations in the skeleton. These chapters are short but will repay careful study by the novice as they will serve to guide him past the principal pitfalls into which an inexperienced observer is liable to fall in interpretation of x-ray plates.

The next five chapters deal with the bones and joints and include the appearances caused both by injury and disease. In the chapter on pathology the reviewer was startled to observe a figure of the head of the tibia labelled, 'Coccidiosis in a child', but on reference to the text he was relieved to find that the paragraph with the introductory word *Coccidiosis* in black type began as follows:—'*Coccidiodes* is a chronic granuloma due to the *Oidium coccidium*.....'. It is difficult to see how 'coccidiosis' can be derived from this name as it is always the generic and not the specific name that is employed in manufacturing names for parasitic diseases. One does not of course expect a specialist in radiography to be conversant with the niceties of parasitological nomenclature, but it is felt that it would have been possible to have avoided such an error as the above without much trouble. Such mistakes are regrettable because the influence of the printed word is so powerful on the minds of many uncritical readers. Do we not constantly hear the remark, 'It must be right; I saw it in a book' no matter how impossible the statement under discussion may be?

The chest, the gastro-intestine and the genito-urinary tract each occupy a separate chapter and there is a short chapter at the end describing the use of the fluoroscope.

This is a short book as it only occupies 356 pages counting from the title page to the end of the index and much of the space is covered by text-figures. It is little more than a summary of the subject, but it is a very good summary and is all that a general practitioner or student needs to keep him abreast of the advance of radiological diagnosis, and it offers the chances of amplifying its pages by a useful bibliography at the end of each chapter.

The price is perhaps somewhat high for a non-essential book to the general practitioner but this is probably unavoidable as the numerous beautiful photographic reproductions necessitating the use of heavy art paper must have inevitably led to high cost of production.

**CUSHNY'S TEXTBOOK OF PHARMACOLOGY AND THERAPEUTICS OR THE ACTION OF DRUGS IN HEALTH AND DISEASE.**—By C. W. Edmunds, A.B., M.B., and J. A. Gunn, M.A., M.D., D.Sc., F.R.C.P. Eleventh Edition. 1936. J. and A. Churchill Limited, London. Pp. 808, with 70 illustrations. Price, 25s.

THE original author's connection with this well-known book ceased with the preparation of the eighth edition which appeared in 1924 as he died suddenly in 1926. The present joint authors have been responsible for the three subsequent editions.

All books on pharmacology to keep up to date have perforce to be revised when the official lists of drugs are so dealt with and the tenth edition appeared in 1932 to bring it into line with the new edition of the British Pharmacopœia in that year and this edition has appeared to keep pace with the United States Pharmacopœia which was revised this year.

Apart from the omission of some drugs and addition of others necessitated by the changes the book on the whole maintains its former character. The authors complain that a strictly logical and scientific arrangement of the substances used in therapeutics is not possible. We are in complete agreement with this statement but feel that possibly atebirin and plasmoquin might have been more logically dealt with than placed at the end of the section under quinine and under the page heading of that drug.

It is also felt that tetrachlorethylene, a drug of proved anthelmintic value, might have been included in this section and that hexylresorcinol should have been mentioned here also, and the only comment on its anthelmintic value not included in the discussion of this drug as a urinary antiseptic.

The value of carbarsone as a drug in the treatment of chronic amœbiasis is not in our opinion sufficiently emphasized and the bibliography on this section does not include any of the references to the work of Chopra and his assistants on this subject.

This is one of the best books in the English language on the uses and actions of drugs and is strongly recommended by the reviewer as a standard book for students or for reference by practitioners. The above criticisms are offered in the hope that the book might be still further improved for workers in the tropics if the authors kept closer watch on the work done in tropical countries and recorded the results in a little more detail.

**MANUAL OF PHARMACOLOGY.**—By the late W. E. Dixon, M.A., M.D., B.S., B.Sc., D.P.H., F.R.S. Eighth Edition, revised by W. A. M. Smart, M.B., B.S., B.Sc., M.R.C.S., L.R.C.P. 1936. Edward Arnold and Company, London. Pp. viii plus 483. Illustrated. Price, 18s.

SINCE its first appearance, the *Manual of Pharmacology* by Professor Walter E. Dixon has been considered as one of the standard textbooks on the subject and has enjoyed a wide popularity in the English-speaking countries. The untimely death of Professor Dixon prevented the appearance of a new edition for over seven years. Pharmacology has made such rapid strides during this period that a revised

edition, bringing the subject matter up to date and in line with the modern development of the subject, was urgently called for. The publication of the eighth edition, revised by Dr. W. A. M. Smart, is therefore very opportune and will undoubtedly be welcomed by students and teachers alike.

To write a new book is admittedly a difficult task; to revise and edit a book from the master hand of Professor Dixon is not only a difficult but a delicate task. The pruning, addition, alteration and 'touching up' have all to be carried out with a good deal of tact and judgment, and it is not always easy to decide as to where to stop. Dr. Smart is to be congratulated for the careful way in which he has performed his duties. He has recast, rewritten and revised a considerable portion of the text, so much so that to a casual reader the book would appear to be a new one, not a new edition of the original Dixon. A careful reader however would find plenty of evidences of the original and the personality of the man behind the book is still to be found.

One feature which attracts immediate notice is the introduction of much organic chemistry. This is very helpful in bringing into prominence the interrelationship between chemical constitution and pharmacological action. Extensive changes were naturally needed in those topics in which there have been important and noteworthy developments. Chief among these are sections dealing with hypnotics, pre-anæsthetic medication, ergot, respiratory drugs, antipyretics, synthetic and anti-malarials. As is common with almost all the books written by Western scientists, topics of interest to students in the tropics have not received exhaustive attention. The vitamins, hormones, sera and vaccines have all been treated in a small chapter. In view of the growing field of utility of these preparations, it would seem desirable to allot a little more space to these subjects.

The book is well printed and the arrangement and grouping of the various headings and sub-headings leave nothing to be desired. We have no hesitation in recommending it to students and medical practitioners, in fact, we consider that it should form part of every medical man's library in this country.

R. N. C.

**A TEXTBOOK OF PHYSIOLOGY.**—By H. E. Roaf, M.D. (Toronto), D.Sc. (Liverpool), M.R.C.S., L.R.C.P. Second Edition, 1936. Edward Arnold and Company, London. Pp. viii plus 679. Illustrated. Price, 21s.

THE manner of presentation as well as the amount and selection of matter are both important in the compilation of a textbook of physiology. The author presents the subject in a manner different from the usual tradition. The book is divided into four parts. The first and second parts deal with the mechanical and chemical activities of the living organisms; the third with the mechanism and regulation of these activities through the nervous system and the endocrine organs; and the last with the maintenance of the individual and the reproduction of the species. This arrangement is likely to give a connected idea of what physiology aims at teaching. Useful information has been incorporated and tiresome details avoided. The diagrams are clear and the description of the experiments is simple. On the whole this is a useful book for the student and we congratulate the author and the publisher on its production.

P. D.

**APPLIED DIETETICS: THE PLANNING AND TEACHING OF NORMAL AND THERAPEUTIC DIETS.**—By F. Stern. 1936. Baillière, Tindall and Cox, London. Pp. xxi plus 263, with 52 tables. Illustrated. Price, 16s.

IT will be many years before we can hope to get a textbook on dietetics written to meet conditions in India and containing tables based on analyses of local foodstuffs. We must therefore turn to those of other

countries. The supply of these is increasing rapidly but each of the examples that we have seen has its own individual features that will make a special appeal to each different class of reader.

In this new book there are a number of outstanding features, but one that will appeal to the teacher and sanitarian is the number of the diagrams, drawings and tables that will be useful both for the lecture theatre and the popular health exhibitions.

The first part of the book consists of chapters on daily requirements, the construction of normal and therapeutic diets, and the education of patients on normal or therapeutic diets. Part II consists of tables designed to simplify the computation of a diet. Part III gives dietary outlines which form the basis of a normal diet and of diets for various abnormal and diseased conditions. Part IV gives simple menus for healthy people at different ages and on different economic scales, and for certain diseased conditions, such as nephritis and diabetes, colitis and constipation.

The reader will find this a very handy and practical textbook on dietetics. Its usefulness in India will be limited only by the fact that reference is not made to many of the important foodstuffs of this country and that the tables of nutrition requirements will also be misleading and will have to be modified for Indians. However, seven-eighths of the information given is directly applicable to local conditions and the book will form an invaluable addition to the library of the physician or sanitarian.

L. E. N.

**DISINFECTION AND STERILIZATION.**—By E. C. McCulloch, M.A., D.V.M., Ph.D. 1936. Henry Kimpton, London. Pp. 525. Illustrated with 53 engravings. Price, 25s.

THE information embodied in this volume is of immense interest to those who are engaged in the study

of bacteriology, systematic or applied. Although the subject is of a highly technical nature yet the author must be congratulated on his lucid way of dealing with the various chapters of this book, so much so that the entire work reads more like an interesting novel than a highly complex volume on bio-physico-chemistry.

The history of the use and development of antiseptics from the days of the ancient Egyptian kings to the present twentieth century is of great interest: in fact, the whole of the first chapter will appeal to even a lay person and the chronological order of arrangement is worthy of an historian of no mean merit. The subsequent chapters deal with the various factors which keep down the bacterial population in nature and the best means of utilizing heat, light, electricity and chemicals in sterilization and disinfection: of these the chemicals have been dealt with more fully and their comparative efficacy and modes of action analyzed and explained very thoroughly. As a book of reference for the worker in bacteriology this volume may be called a veritable mine of information: for those who are engaged in the administration of public health the chapters on water purification and sewage treatment offer many practical and valuable hints which can be adopted or slightly modified to suit local conditions. The undergraduate student of bacteriology will perhaps find the book heavy reading, but those who intend taking up higher studies in the subject will be well advised to keep a copy of this book, for herein will be found many points of interest which are not usually found in a standard textbook of bacteriology. The last chapter of the book is very instructive in so far as it deals with the almost futile use of antiseptics in medical or surgical practice without actually dogmatizing on any particular method of treatment. The few suggestions and hints laid down are very rational and strictly scientific.

K. P. B.

## Abstracts from Reports

### REPORT OF THE SUDAN MEDICAL SERVICE FOR THE YEAR 1935

#### *Subjects of special interest*

#### *(a) Interim report on kala-azar investigations (by Sir Robert Archibald, Adviser in Medical Research)*

In view of the possibility of kala-azar being conveyed from man to man by blood-sucking insects, it was important to ascertain whether leishmania parasites were present in the peripheral blood of cases of kala-azar in all stages of the disease. A thorough examination of 190 peripheral blood films taken from 31 cases of kala-azar showed parasites present in two cases = 6.4 per cent. In each the parasites were found phagocyted within a polymorph and mononuclear leucocyte respectively. One case contracted the disease in the Fung, the other case in Eastern Mongalla.

Nasal swabs from 22 cases showed leishmania in seven cases = 31 per cent. In two cases heavy infections were found.

Examinations of faeces, centrifuged urine and conjunctival secretions of cases of kala-azar proved negative for leishmania.

Examinations of viscera of dogs, cats, ground-squirrels, fowls, gekkos and lizards in kala-azar villages proved negative for leishmania parasites.

Examinations of large numbers of wild sand flies, mosquitoes, house-flies, lice and bed bugs caught in kala-azar huts and in the kala-azar ward of Singa hospital showed no evidence of leishmania parasites or their cultural forms.

Epidemiological data collected strongly indicate 'the contact factor' with or without an intermediate host as an important factor concerned in the endemology of a disease which, so far, has not appeared in epidemic form.

Examination of all contacts of cases of kala-azar is an essential measure in the control of the disease; it will serve to detect early cases as well as cases which are not seeking medical treatment; such cases, as proved at Daragil, assist in maintaining infection in villages.

In two instances young infants born of mothers suffering from kala-azar showed no signs of the disease four to six months after birth.

No evidence has been found or exists that dermal leishmaniasis occurs in the Fung or Rahad district.

Oral leishmaniasis is probably more common than is suspected. One case admitted to hospital for necrosis of the jaw showed leishmania in a slightly enlarged spleen, numerous parasites in nasal swabs, and one parasite phagocyted in a leucocyte was found in the peripheral blood.

#### *Animal experiments*

Grey monkeys have been infected by subcutaneous inoculation. Leishmania parasites have been found in nasal swabs taken 21 days after intraperitoneal inoculation.

Grey monkeys have been infected by nasal swabbing and nasal spraying of infective material. Two out of five healthy monkeys contracted kala-azar infection when placed in contact with five experimentally infected monkeys in an insect-proof room.

#### *(b) Vitamin 'A' prophylaxis for cerebro-spinal meningitis (by Dr. N. L. Corkill)*

In 1934 an epidemic of a severity hitherto not experienced swept Eastern and Central Kordofan and, when it closed with the advent of the rainy season, its spread had reached the neighbourhoods of Dilling and Heiban.

A further epidemic affecting the whole Nuba area was forecasted for the next dry season (commencing

October 1934) on three grounds, (a) the dispersal of carriers on the abolition of the quarantines, (b) the lack of recent meningitis experience in the population as a whole, and (c) the economic depression since 1931 coupled with an apparent neglect of food crops by the Nubas for the more attractive money crop of cotton, the growing of which had developed at a phenomenal rate.

On account of (c) it was decided to attribute the unprecedented severity of the 1934 epidemic to sub-nutrition and to apply an experiment to assess the value, if any, of Mellanby's 'anti-infective vitamin A' as a prophylactic.

The expected epidemic occurred, the vitamin concentrate Essogen was procured and two experiments were conducted.

The results were inconclusive but favourable rather than unfavourable to the drug being of value.

There is, however, a further point in its favour. The incidence rapidly declined in medicated communities as a whole, as compared with the controls as a whole, but the mortality rate in the medicated was greater than that in the controls, the explanation probably being that persons on the border line of susceptibility were saved from infection by vitamin and thus mortality became more concentrated in the marasmic remainder. Now, on analysing the data amassed during the epidemic it was found that, when incidence increased but mortality decreased, a factor was at work increasing susceptibility, and conversely that, when incidence decreased but mortality increased, a factor increasing susceptibility was being removed. Assuming this to be a valid law and applying it to incidence and mortality comparisons as between the medicated and the control groups, it is seen that in the former a factor increasing susceptibility was being removed; this factor would appear to be a deficiency of vitamin A.

Viewing these results in academic isolation, they do not constitute a strong case for the use of Essogen. Viewing them in relationship with what is known of the diet and diseases of Sudanese and what has been published, they form a practical justification for further experiment and the immediate adoption of the routine use of a vitamin-A concentrate in outbreaks of meningitis and pneumonia amongst prisoners, troops and institutions of the nature of schools.

#### REPORT OF STACK MEDICAL RESEARCH LABORATORIES

By DR. E. S. HORGAN

The Stack Medical Research Laboratories, built in 1927-28 as a memorial to the late Sir Lee Stack, formed the bacteriological unit of the Wellcome Tropical Research Laboratories organization. With the retirement of the director and the subsequent decentralization, the laboratories became an integral part of the Sudan Medical Service from the 1st April, 1935, thus forming the nucleus of the present laboratory services. The activities of the laboratories may be classified under three main heads:—

##### RESEARCH

Having been incorporated in the Sudan Medical Service, it is proposed, in the future, not to regard the laboratory as a detached organization, but to collaborate with the medical service, as a whole, in more extensive field operations. The first problem to receive attention along these lines will be malaria in the Gezira in relation to which an entomological survey has already commenced.

##### ROUTINE ACTIVITIES

These may be divided into (a) routine examinations of specimens and (b) preparation of vaccines. Routine specimens are sent in from all parts of the Sudan, but as might be expected a considerable proportion of such come from the Khartoum-Omdurman thickly-populated area. A recent feature is the large and steady increase in specimens sent in from provincial hospitals and dispensaries, while the total examinations have doubled within the last five years. There is sometimes a certain tendency to lay undue emphasis on an increase of routine examinations in evaluating the efficiency of a

tropical research laboratory. Such increases are no doubt very gratifying but there seems a certain risk in allowing them to choke the essential research activities of such a laboratory.

In a country like the Sudan the fundamental importance of short range research demands a close liaison between it and routine examinations, the latter forming its raw material but at the same time it is equally important to hold a balance between them. The increase of routine work in the laboratory for the past five years has been an inevitable feature of the expansion of medical activities through the Sudan, but it is hoped, in the near future, by raising the standard of the small hospital laboratories throughout the country to decentralize considerably the volume of such work, in particular the simpler examinations of clinical pathology, and so leave the central laboratory more opportunities to deal with the important or difficult tests and the problems arising therefrom.

Another point in the work of a tropical laboratory which seems to have received insufficient attention is the statistical significance of negative results. It is perhaps not fully appreciated by home workers that the standard routine methods often give very misleading and fallacious results in tropical conditions, and hence an important element in routine research is the elaboration and the application of more accurate methods.

##### EDUCATIONAL

(a) *Improved training of Sudanese laboratory assistants for the hospital laboratory service.*—For some years past it has been the practice to send intelligent hospital orderlies to the laboratory for training in the simpler routine tests and after a period of tuition to send them out to the various provincial hospitals. Owing to the increasing demands for such assistants it was not always possible to give a sufficiently full course and frequently the candidates sent in were most unsuitable for laboratory work.

The present service of Sudanese laboratory assistants has been organized as follows: Every member of the existing service will undergo a full course of training for the Stack Laboratories, irrespective of the length of time he has already been in the medical service. The period of tuition proposed is at least four months. Their present educational standard is somewhat varied but all can read and write Arabic, a few have a good primary school education, and some have a certain knowledge of English. Tuition is carried out in Arabic by the British laboratory assistants under the superintendence of the assistant director of laboratory services and is entirely practical. The course is divided into two sections—(i) clinical pathology on which at least three months must be spent, special emphasis being laid on parasitological examinations of blood, faeces and urine, and the common bacteriological staining methods, viz, Gram's, Neisser's, Ziehl-Neelsen, etc., (ii) a practical course in the methods of dealing with infected materials; use of antiseptics, cleaning glassware, plugging tubes, making swabs and capillary pipettes, sealing ampoules, etc. This part is demonstrated by the head Sudanese laboratory attendant under the direct supervision of the senior British assistant. At the end of the course, a practical examination is held by the assistant director of laboratory services, and successful candidates recommended to the director, medical service, for promotion as classified officials.

To ensure the maintenance of this standard as far as possible, all Sudanese assistants will be brought back in due rotation for 'refresher' courses.

Hospital laboratories. The equipment is being standardized, all stains, reagents, etc., being the same as those used in the Stack Laboratories and issued in solution, as it has been found by experience that the local preparation of stains such as Leishman's is quite hopeless.

(b) *Teaching of medical students.*—The Stack Laboratories are in close association with the Kitchener School of Medicine and, in addition to courses in

pathology, bacteriology, and parasitology given by the bacteriologists, a small pathological museum is maintained. Post-mortem demonstrations are also given, but, owing presumably to local prejudices, the number of autopsies is lamentably small and their rarity remains a weak feature in the education of the medical students. An attempt to lessen the difficulty is being made by increasing the number and variety of unmounted pathological specimens which can be handled by the students. It is not pretended that this is an efficient substitute for fresh post-mortem specimens. Furthermore, owing to the high temperature in Khartoum for a large part of the year, the preservation of mounted or unmounted specimens is a task of considerable difficulty and no really satisfactory method has yet been found for the preservation of colour.

*Rabies research.* Staining methods:—

It is doubtful if any of the usually recommended methods gives altogether satisfactory results with formalin-fixed brains.

The value of formalin however in a country like the Sudan lies in the ease with which a solution can be prepared, as it is supplied to all hospitals and dispensaries as an ordinary issue. Consequently, attention has been devoted to methods which will give the best histological differentiation with formalin-fixed brains. Trials are now being made with the Safranin-Fuchsin method of Lépine which is claimed to give excellent results for demonstrating Negri bodies.

Owing to the suggestive results of several recent workers that the mid-brain or medulla is more suitable for examination for Negri bodies than the usual hippocampus an investigation is now being made into this point on all brains received for routine examination.

*Yellow fever.*—Survey work was continued in two directions:—

(1) *Examination of livers.*—Routine instructions have been sent to all senior medical inspectors in the southern and western Sudan to send in specimens of liver from as many cases as possible of jaundice or fever of unknown origin dying within eight or nine days. Viscerotomy, as recommended by Dr. Soper of the Rockefeller Foundation, have been supplied to all important stations in the south and have proved of great value in obtaining specimens of liver from cases where a post-mortem examination was refused.

During the year 30 specimens of liver were received—29 of which were negative for yellow fever.

The following was the only suspicious case and serves well to illustrate the difficulty of diagnosis in a doubtful case from a viscerotomy specimen of liver and the possible fallacies that may arise through the sole use of this method.

The history of the case was as follows:—

Patient was a male about 25 years of age who came direct to Malakal from Liri Nuba taking four days on the journey. He remained well for 16 days and then complained of severe epigastric pain and vomiting. Three days from the onset of symptoms he was admitted to hospital with intense jaundice and in a comatose condition. There was no fever while he was in hospital nor history of any before admission, nor did he vomit while in hospital. Spleen and liver not enlarged. Blood slide negative for malarial parasites but positive for *Filaria bancrofti*. Urine contained albumin (+ +), blood (+ +) and ova of *S. haematobium*. Cerebrospinal fluid showed no abnormalities. After two and a half days in a comatose condition he died. An autopsy being refused, only a viscerotomy specimen of liver was taken. Examination of this showed a widespread fatty degeneration of moderate degree and areas of eosinophilic necrosis. These areas were not definitely mid-zonal. What appeared to be Councilman bodies were present and certain of the nuclei showed suggestive changes.

Owing to the suspicious changes in the liver, the slide was sent to Dr. G. M. Findlay, Wellcome Bureau of Scientific Research, London, for his opinion.

He reported as follows:—

'The liver slides which arrived yesterday were extraordinarily suggestive of yellow fever and had they

come from a case in West Africa or one with a more suggestive clinical history, I should have had little hesitation in saying that they were from a case of yellow fever. If the history is correct and the man was only ill a short time, the intense jaundice is not characteristic of yellow fever. It usually only comes on in yellow fever cases about the eighth or ninth day. The absence of temperature is also peculiar, though it is difficult to imagine that such extensive necrosis could occur in the absence of all fever. There are quite a number of Councilman lesions in the liver and also, I think, intranuclear inclusions'.

Taking all factors into consideration it seems extremely doubtful if the case was one of yellow fever, in spite of the suggestive histological appearances.

(2) *Collection of sera for mouse-protection tests.*—The serum is pipetted off and sent in sealed ampoules to the laboratories where it is forwarded on to Dr. G. M. Findlay for the mouse-protection tests.

It might be mentioned that owing to strong recommendations Behring's venules were first tried but proved completely useless, the blood becoming rapidly haemolyzed and arriving as a thick syrupy fluid useless for any serological test.

Serum from 29 cases was sent to London, of which nine showed protection; eight of the positive cases were from the southern Sudan, and one from Wad Medani. Investigation of the last showed that the patient was a cattleman from the western Sudan and the result therefore is of little significance.

*Cases of jaundice of unknown aetiology.*—During and previous to the yellow fever survey of the past two years numbers of cases of a clinical syndrome of unknown origin have been reported. The symptoms are usually moderate fever (in most cases), deep jaundice, vomiting in some cases, albuminuria is usually present but, in most cases, appears to be of slight degree. In some of the fatal cases leucocytosis (polymorphonuclear) is present, in one fatal case the white count shortly before death being 50,000 per c.mm., but this is unusual. A considerable number of such cases died but, as it is very difficult to obtain any reliable record of the total number, it is impossible at present to say if the mortality is high.

*Pathology.* All examinations of blood, urine and faeces have been negative. Mouse-protection tests have also given negative results. On several occasions it has been possible to investigate small outbreaks more fully and the possibility of leptospiral infections has been borne in mind but in no case have leptospirae been isolated, and adhesion tests, kindly carried out by Major H. C. Brown of the Wellcome Bureau of Scientific Research, have always been negative.

*Pathological lesions.* The microscopic appearances of the liver are very variable and often appear to bear no relation to the intensity of the jaundice and other symptoms. As a rule however there is well-marked necrosis, in some cases so extreme that all semblance to liver structure is lost. Haemorrhagic changes are uncommon and infiltration of portal tracts and necrosed areas by lymphocytes is variable. Fatty changes are rare and there is no eosinophilic degeneration of the cytoplasm of affected liver cells. The spleen is usually greatly congested and, in some cases, there is a central necrosis of the Malpighian bodies. The kidneys are often congested and show changes in the convoluted tubules ranging from a cloudy swelling to a definite necrosis of the epithelium; the latter is, however, uncommon. Bile staining of the necrosed tubules may be present.

The resemblances, especially in the liver, between these cases and cases of an obscure infective disease associated with jaundice occurring in Nigeria have often been noted but until something more is known of the aetiology of the Sudan cases further speculation on this point is profitless.

*Kala-azar.*—Since the discovery by Forkner and Zia of the occurrence of Leishman-Donovan bodies in nasal and tonsillar swabs these are being examined as a routine diagnostic procedure. Positive results are



frequently observed even in early cases where serological tests are negative but the value of the operation is at present *sub judice*.

**THE BRITISH GUIANA MEDICAL ANNUAL FOR 1936. TWENTY-SIXTH YEAR OF ISSUE. EDITED BY G. H. STEVEN, M.B., Ch.B. (EDIN.), AND A. G. COIA, M.B., Ch.B. (EDIN.). PRINTED BY 'THE ARGOSY' COMPANY, LIMITED, BRITISH GUIANA**

This is a collection of papers by practitioners in the colony, and it is also apparently the local organ of the British Medical Association as it includes a synopsis of the meetings of this body since the publication of the previous issue. The volume also contains fourteen papers which are mainly of clinical interest.

In a preparatory note the editors 'have again to apologize for the interval since the last publication'. Reference to our back numbers shows that number twenty-five of this 'annual' covered the year 1932 and was reviewed by us in September 1933. If the more regular appearance of this booklet cannot be assured those responsible for its appearance would be well advised to alter its title.

**REPORT ON THE PUBLIC HEALTH ADMINISTRATION OF BURMA FOR THE YEAR 1935 INCLUDING ADMINISTRATION OF VACCINATION IN 1935-36**

**Cholera 0.57.**—The death rate from cholera this year is the highest since 1930; it is 0.50 over the previous year and 0.51 in excess of the five-year mean. The year opened inauspiciously, for by the 1st January this disease was present in severe epidemic form in the Irrawaddy division. Early in January, it appeared in Pegu and Tenasserim divisions. The epidemic in Pegu division was limited in extent but that in Tenasserim assumed grave proportions. By May every division in the country was infected in varying degrees. The seasonal prevalence of the outbreak was most unusual for Burma. Whereas in previous years a cholera epidemic was usually limited to the months of April to July, the epidemic of 1935 increased in intensity between January and April, declined somewhat in May and June and increased again in July and August. After that it declined steadily towards the end of the year. The highest mortality was in the Tenasserim division, especially in Mergui district.

The disease was mainly prevalent in rural areas, and the difficulty of communications made the task of the public health staff a very formidable one. The cadre of epidemic sub-assistant surgeons employed for epidemic duty was increased from 19 to 27 in January, and this strength was maintained for most of the year. From the reports of these sub-assistant surgeons, an idea can be gained of the hardships and obstacles which had to be overcome in reaching the far-flung areas to which the epidemic spread. The enthusiasm and keen sense of duty of the epidemic staff is reflected in the satisfactory total of 576,216 inoculations which they carried out. This is a record figure for Burma, the greatest number of inoculations in any previous year being 186,435. Regrettable though the necessity may have been for the inoculations, the response of the people to this modern method of protection is very encouraging, and is a striking example of the changing outlook of the populace towards the causes and prevention of this particular epidemic disease.

**Anti-cholera measures.**—Inoculation with anti-cholera vaccine and the purification of water supplies as far as practicable were the two main measures relied on. Intensive propaganda was carried out by the epidemic sub-assistant surgeons of this department and by the hygiene publicity officer. That fact combined with the intensity of the outbreak and the increasing recognition on the part of the people of the value of cholera inoculation, resulted in a record number of inoculations being performed. A close enquiry was made regarding

any cholera deaths occurring amongst those who were inoculated. Figures have been collected from four districts relating to 241,713 inoculated individuals. As far as can be ascertained only 18 persons died of cholera amongst this inoculated population. Eight of these died within 72 hours of inoculation, *i.e.*, before immunity could be expected to be established. These figures are at present being subjected to a close scrutiny in co-operation with the statistical department of the Rangoon University, and it is hoped to publish them shortly, with conclusions drawn. The districts in which the largest number of cholera inoculations was carried out were Mergui 58,771, Pyapon 56,682, Maubin 49,849 and Pakokku 46,605.

As far as possible, the holding of *pweds* and festivals was restricted, but between the months of March and April this is a matter which presents some difficulty. Bleaching powder was used extensively in the purification of water supplies.

**Smallpox 0.10.**—The rate is 0.03 below the previous year and 0.02 below the five-year mean. Every district, except Kyaukpadaung and Sandoway, reported mortality from this cause. As usual, the period March to May produced the greatest number of cases, and the lowest prevalence was in November. An analysis of the deaths by ages shows that 7.77 per cent of the deaths occurred among children under one year, 22.11 per cent among children between one year and under ten years and 70.13 per cent among people over ten years. The Vaccination Act which enforces primary vaccination in children who have attained the age of six months, has been in force in Burma since 1883 in the towns and since 1923 in the rural areas. The vast majority of the people get vaccinated as children and the value of primary vaccination is recognized generally. Until the necessity for revaccination is similarly appreciated, the annual mortality among people over ten years of age will be difficult to avert.

**Plague 0.11.**—It is satisfactory to record that this rate is the second lowest recorded in the province for this disease, since it first appeared in epidemic form in the year 1905. It is 0.08 below the previous year and 0.03 below the five-year mean. The improvement has been in the urban areas. As usual the sea-board districts of Arakan, Tavoy and Mergui were free. Other districts recording no mortality from plague were Hanthawaddy, Myaungmya, Thayetmyo, Pakokku, Kyaukse and Lower Chindwin. November to March was as usual the period during which the disease was most prevalent, 1,013 deaths out of a total of 1,312 occurring in these months.

**Anti-plague measures.**—The use of cyanogas for the destruction of rats was introduced to the province in July 1934 and by the end of 1935 there were 49 towns and 20 districts in possession of the necessary apparatus together with a supply of cyanogas. A large number of the health staff in the municipal and rural areas had by that time been trained in the use of this poison. Throughout the year this method of rat destruction was used extensively. Although it is impossible to ascertain the number of rats destroyed, the reports received state that there was a perceptible decrease in the rat population in the areas in which cyanogas was used. An improved type of cyanogas pump fitted with a cut-out device came on the market. With this pump the operator, after the requisite amount of cyanogas has been pumped into the rat burrow, is enabled to continue pumping air so as to ensure the effective distribution of the gas throughout the rat burrow system. This results in more effective use of the gas, and at the same time in an economy in the amount of cyanogas expended.

**Fevers 7.31.**—This figure is 0.47 below the previous year, but is 0.30 in excess of the five-year mean. Any decrease in this figure is most welcome, for this disease group accounts for 35.78 per cent of the total mortality in the province. The reduction of 0.47 per 1,000 corresponds to 5,741 less actual deaths. Mortality from this group of fevers is mainly reported from the rural areas where the village headmen are the registrars.



The vast majority of cases with a rise in temperature are classified under this heading. In spite of this unsatisfactory diagnosis, there is no doubt that malaria causes a considerable portion of these deaths. The highest number of deaths from fever occurred in the month of December, and it is in that month that the highest incidence of malaria was also recorded. The lowest number of deaths was recorded in the month of February.

**Enteric fever 0.22.**—As the diagnosis of this disease is so often dependent on accurate bacteriological examination, it is believed that the total of 315 deaths recorded during the year falls short of the true mortality. Blood specimens for culture are taken by medical practitioners in only the minority of cases of fever, and for that reason many enteric infections are probably missed. Other factors against the detection of enteric cases are the remote chances of isolating the organism from the blood after the first week of the disease, and the fact that patients frequently wait for an appreciable time before calling in a medical man.

**Dysentery and diarrhoea 0.53.**—The provincial rate is 0.11 over the previous year and 0.06 higher than the five-year mean. Associated with the outbreak of the cholera epidemic, there was also an increase in the number of deaths reported from dysentery and diarrhoea. There was undoubtedly in the rural areas a certain amount of confusion regarding diagnosis, and it is probable that a certain number of the early cases of cholera was ascribed to this group of dysentery and diarrhoea. Some headmen are averse to diagnosing cholera on account of the alarm it may cause amongst the inhabitants, or perhaps, in some cases, on account of the extra work and trouble it may entail. The highest mortality from dysentery and diarrhoea was, as usual, recorded in the month of July and the lowest figures were recorded in February.

**Respiratory diseases 0.99.**—This is 0.08 lower than the previous year's figure and 0.01 below the five-year mean. The highest mortality occurred in December and the lowest figures were recorded in February. Each year there is marked preponderance of deaths amongst males, the proportion in 1935 to the deaths amongst females being 146 to 100.

**Goitre.**—The disease is reported from a number of districts mainly in the hilly areas such as the Shan villages in Thandaung township in Toungoo district, the Kachin Hill Tracts in Bhamo district and among the Hill Karens in Salween district. In the Southern Shan States it is reported from amongst the hill inhabitants of Kengtung subdivision. Treatment in the civil hospitals has been carried out extensively in some districts such as Myitkyina 1,726 cases, Northern Shan States 6,673 cases, and Mogök and Thabeitkyin hospitals 564 cases.

**Favus.**—This disease is very prevalent along the valley of the Tenasserim river in Tavoy and Mergui district. It is also prevalent in Victoria Point subdivision and Bokpyin township in Mergui district. No treatment was carried out in these areas during 1935 owing to lack of funds.

**Leprosy.**—Colonies for the housing, feeding and treatment of lepers were maintained at Mōnywa and Minbu during the year.

This department considers that in the establishment of leper colonies lies the most effective measure for the control of leprosy in Burma. A colony is much cheaper to establish and to maintain than an asylum. It has an advantage over clinics in that in the colony the treatment can be taken to the segregated lepers, instead of expecting the individual lepers to go for treatment to the nearest hospital clinic which is frequently some miles distant. Were sufficient colonies started throughout the province, they would exercise a marked effect in checking the spread of leprosy amongst the general population, and in addition they would exercise a marked effect on the control of pauper lepers. The class of leper who now leaves his village to go and beg in the towns would have a colony to go to where

his housing and food would be assured, where the conditions of life would approximate to those of his village and where he would get regular treatment leading to cure or early arrest of his condition. He would be spared the experience of being regarded as an outcast and having to descend to the level of a pauper.

**Snake-bite.**—The mortality due to snake-bite has become a subject of public interest in the last couple of years, as evidenced by questions asked in the Legislative Council and articles on the subject in the newspapers. Up to 1935 the mortality figures from snake-bite were collected under the same heading as deaths due to wild-beasts. For 1935, snake-bite figures have been compiled separately and these show that 2,186 deaths occurred during the year from this cause. Only 76 deaths were in towns the balance of 2,110 being in the rural areas. The provincial death rate was 0.18 and the rural and urban death rates were 0.20 and 0.05 respectively. The Russell's viper is said to be the commonest cause of death.

The highest seasonal incidence was in the month of December. A pamphlet in Burmese containing advice on the prevention and treatment of snake-bite was issued in January 1936, from the Hygiene Publicity Bureau of this department, and its distribution, especially in rural areas, is being continued.

**Conservancy.**—During the year 90 bored-hole latrines were constructed at Einmè and 17 at Thayetkōn in Myaungmya district. The cost of these latrines was met by the district council. This is an example which might well be followed by the district councils in those areas where bored-hole latrines can be constructed. In Kyaiklat township in Pyapōn district a number of bored-hole latrines were made and are reported to be working satisfactorily. A few bored-hole latrines were constructed in some of the villages in Insein township for demonstration purposes.

**Rural health unit, Hlègu.**—This is the sixth year in which the unit has been in operation. As in the previous years the work undertaken included the collection and study of vital statistics, health education, vaccination, school medical inspection, maternity and child welfare work, control of acute communicable diseases, refuse and sewage disposal, improvement of water supplies and abatement of nuisances.

Registration of vital statistics has been markedly improved. The birth rate of 35.51 recorded during the year is the highest since the inception of the unit. The mean birth rate for the five years prior to the starting of the unit was 16.89 per thousand. In order to encourage birth registration a new and attractive design of birth registration certificate was introduced during the year. This has captured the villager's imagination and has acted as good propaganda for early birth registration. Improvement has also been brought about in death registration. The death rate during 1935 was 20.20. The five-year mean rate prior to the unit's inception was 12.72. The infant mortality rate of 124.84 for 1935 is the lowest since the inception of the unit. There were 14 maternal deaths giving a ratio of 6.01 per thousand registered births and 74 stillbirths giving a ratio of 3.17 per hundred live births. The vital index of the area was 175.79.

Of the acute communicable diseases, there was one case of cholera who recovered and seven cases of small-pox with one death. Primary and revaccinations were carried out among 4,950 persons during the year. By the end of the year 68 per cent of the population in Hlègu township were protected by either primary or revaccination. Of the less acute communicable diseases, there were 26 cases of chickenpox, four cases of measles and 60 cases of whooping cough. Lectures, health conferences, lantern talks, cinema shows and school health talks totalled 280 with an approximate total attendance of 11,795. There were 247 infant and maternal welfare clinics held at the two centres in Hlègu and Dabein with a total attendance of 1,771. The nurse carried out 3,682 home visits. The two midwives conducted 413 confinement cases and paid 1,651 prenatal and 1,564 postnatal visits.

During the year there were 36 registered vernacular schools in the Health Unit area; of these 17 were provided with individual drinking watercups, cupracks and properly protected water receptacles. Ventilation in the schools was sufficient, but in the majority of the schools the light was found defective. Improvement was, however, noticed in six schools. Regular school medical inspection was made in 22 schools and 1,156 children were given a thorough physical examination. Among this number, 380 or 32.87 per cent were found free from physical defects.

The unit continued to assist in leprosy work in the township so far as time and personnel permitted.

The number of laboratory examinations carried out was 89. Oil of chenopodium was administered to 2,453 persons for the treatment of round worm infection, and of the 1,972 cases in which the results were known 96.7 per cent were relieved. *Gambusia affinis* were distributed to four tanks in three villages as an antimosquito measure, and 100 malarious patients received 1,883 cinchona febrifuge tablets.

Measures for the improvement of environmental sanitation were continued as in previous years. A total of 395 inspections was made of wells and tanks and suggestions were given for their improvement; seven wells and two tanks were provided with force pumps and 34 wells were chlorinated. Sanitary inspections of food establishments and commercial premises totalled 1,528. Anti-rat measures were carried out as a routine and 355 rat holes were fumigated with cyanogas, 490 holes blocked and 5,742 rats were trapped or poisoned. During the year 1,556 lorry loads of refuse were removed to the dumping grounds in Hlègu and Dabain.

The policy of encouraging the householder to construct bored-hole latrines was continued and during the year 201 additional bored-hole latrines were provided. In 20 per cent of these the householder contributed part of the cost. The total number of bored-hole latrines constructed by the unit up to the end of 1935 was 1,828 in 17 villages. Under the supervision of a public health inspector the construction of bored-hole latrines was carried out in four villages in Insein township for demonstration purposes, and a number of boring implements were kept on hand for loan or for sale to local bodies. The total cost of constructing a bored-hole latrine in Hlègu is Rs. 7-14 which includes a reinforced concrete squatting plate of the latest design; the householder provides the superstructure. From the experience in this township and from data collected over a period of six years, when used with reasonable care a bored-hole latrine will last for four years for a family of five to eight persons. The constant use of a well-fitting cover prevents all fly breeding; but where this precaution is neglected and fly breeding occurs, a half inch layer of old motor oil or crude oil effectively stops the nuisance.

In its capacity as a field training centre for practical training of public health personnel, the unit undertook during the year the training of one assistant district health officer, nine sub-assistant surgeons and three public health inspectors. Six students for the Government of Burma License in Hygiene, eight students of the health visitors training class and fifteen students of the medical college visited the unit to gain practical knowledge in dealing with public health problems. Since its inception the unit has undertaken the practical training of 171 public health personnel.

*Cinchona febrifuge tablets.*—As usual, these were manufactured in the Rangoon jail, from where they were distributed to district treasuries either for issue on payment or for free issue when authorized. During the year 3,826,980 tablets were sold by the treasuries, which is an increase of 455,400 tablets over the sales of 1934. However, the increase was not general and was mainly confined to the Southern Shan States. The average consumption of cinchona febrifuge per head of population rose from 0.87 grain in 1933 to 1.00 in 1934 and to 1.20 in the year under review.

*Maternity work.*—In 1935 there were 34 midwives employed by 11 voluntary child welfare societies, and they attended 6,095 confinements, while 186 midwives employed by municipalities and district councils attended 19,447 confinements. In the towns of Burma 30.21 per cent of the total births were attended by midwives employed by child welfare societies or local bodies, and the corresponding figure in rural areas was 2.73 per cent. A large number of midwives are engaged in private practice, but the figures of the cases attended by them are not available, nor are those of the cases attended by private medical practitioners.

After the close of the year the Rural Health Unit, Hlègu, started an experiment of employing midwives on a reduced pay, and permitting them to charge fees proportionate to the means of the patient. An official receipt is given for every fee that is charged. It is believed that the people do not resent paying a moderate charge. The giving of an official receipt by the Health Unit obviates any abuse. The Hlègu system is still at the experimental stage, but the reports are encouraging. If it is a success, it might be followed by the district councils in the province, as it will enable the local bodies to employ an appreciably increased number of midwives without increasing the expenditure.

*Health education.*—In recent years there has been a marked development in this form of health activity. In 1935, there was a further appreciable increase in the amount of lecturing work. An encouraging sign was the many demands received from local bodies, public institutions and voluntary welfare organizations for literature on health subjects, for the loan of the Red Cross Society's health exhibits and for the services of the hygiene publicity officer.

The post of the hygiene publicity officer was kept vacant owing to financial stringency, but sub-assistant surgeon U. Tha Saing continued to carry out very effective health propaganda work.

[These abstracts only give a brief outline of the many activities of this very live public health department and detailed study of this report would repay any provincial health officer.]

#### ADMINISTRATION REPORT OF THE MUNICIPAL COMMISSIONER FOR THE CITY OF BOMBAY FOR THE YEAR 1935-36. VOLUME II. ANNUAL REPORT OF THE EXECUTIVE HEALTH OFFICER FOR 1935

*Review of the year.*—The number of live births registered during the year was more by 5,139 than the number of deaths that took place in the city. This excess of births over deaths was equivalent to 4.4 per 1,000 population calculated on the census of 1931 and was recorded five times in succession. Before 1931 there was no such excess since 1866, the year in which birth records were instituted. The number of live births registered was 34,428, being 704 more than in 1934, 8,795 more than the average of the last ten years 1925 to 1934 and the highest on record since 1866. The birth rate calculated on the census population of 1931 was 29.6 births per 1,000.

The total number of deaths from all causes was 29,289, being 1,919 more than in 1934, 3,278 more than the average for the last five years (1930 to 1934) and 1,737 more than that for the preceding decennium (1925 to 1934). The death rate per 1,000 of census population of 1931 was 25.2 as against 23.6 in 1934 and 23.7 the rate recorded for the decennium 1925 to 1934.

There was only one death from plague during the year as against 31 in 1934 and 89 the average of the last ten years 1925 to 1934. Smallpox was in an epidemic form and caused 1,248 deaths as against 152 in 1934 and 846 the average for the last decennium 1925 to 1934. Cholera was registered as the cause of 13 deaths (including 8 imported) against the same number in 1934 and 17 less than the average for the ten years 1925 to 1934. Influenza was prevalent in a mild form in the city during the year and caused 72 deaths as against 98 in the preceding year and 86 the average

for the last decennium 1925 to 1934. The deaths from diseases of the respiratory system numbered 10,642, being 586 more than in 1934 and 617 more than the average of the last ten years 1925 to 1934. Tuberculosis accounted for 1,929 deaths as against 1,856 in 1934 and 1,604 the average for the preceding decennium 1925 to 1934.

Ninety-seven deaths were due to malaria, being four less than in 1934 and 170 less than the average of the last decennium (1925 to 1934). There were 1,389 deaths from ague and remittent fever as against 1,397 in 1934. The average number of deaths for the last ten years (1925 to 1934) from malaria was 267 and from ague and remittent fever 1,569. The deaths among infants under one year of age numbered 8,455 against 8,253 in 1934 and 7,474 the average for the last ten years 1925 to 1934. The rate of infant deaths per 1,000 births registered was 245.6 as against 291.6 the mean of the preceding decennium.

Compared with the decennial averages (1925 to 1934) the total number of deaths shows an increase of 1,737, the principal increase in the mortality being 402 deaths under smallpox, 617 under respiratory diseases, 241 under diarrhoea and dysentery, 153 under measles, 325 under tuberculosis, 70 under cerebro-spinal fever and 54 under enteric. On the other hand there was a decrease in deaths under plague by 88, under influenza by 14, under ague and remittent fever by 180 and under malaria by 170.

*Prevention of infantile mortality.*—The work which is being done in Bombay for the reduction of infant mortality may be described under the following heads:—

(i) Visits by the municipal district nurses for the purpose of getting into touch with prospective mothers and for discovering cases of sickness especially among women and children and unvaccinated children; for enquiry into the condition of new born infants; and for giving instruction by homely talks as to the care and rearing of children.

(ii) Attendance on confinements.

(iii) Provision of necessaries and comforts during the lying-in period.

(iv) Maternity homes.

(v) Infant welfare centres and infant milk depots.

*Municipal nurses.*—The number of municipal nurses employed is ten, one being attached to each of the ten district registrars' offices. They visit daily the localities and the *chawls* inhabited by the poor and help to diffuse and popularize elementary knowledge of the principles of health and hygiene and to carry such knowledge into the homes and lives of the ignorant; they give advice on the prevention of disease and the care and up-bringing of infants and bring to the notice of the authorities unregistered births, unvaccinated children and cases of sickness; they also persuade prospective mothers to go to the maternity homes provided for them free. Where this provision is not taken advantage of, they attend on the women in their own houses providing them with bedding for the confinement, and with food in the shape of milk and bread during the first seven days of the puerperal period. The visits of the nurses are frequently the means of bringing to the municipal dispensaries sick persons who would otherwise either not know the existence of the facilities provided or knowing would, through indifference and apathy, neglect to benefit by them. These visits are doing much good and are welcomed and appreciated by those for whose benefit they are paid.

*Infant welfare society.*—This society has been doing good work. At the end of the year there were seven centres, three maternity homes and one crèche at DeLisle Road. Each centre is in charge of a lady doctor (full time), a graduate of the Bombay University, under whom there is a supervisor and a health visitor; the former is a fully qualified, diplomaed nurse and the latter is a qualified maternity nurse.

The supervisor looks to the distribution of milk and assists the lady doctor at the clinics and in advising mothers on infant management. The health visitor

visits her district and persuades the expectant mothers to take advantage of the maternity home in the city and to bring their babies to infant welfare centres for milk and treatment.

The society provides through its centres and homes (i) advice and instruction to mothers as to infant management; (ii) treatment to infants for minor maladies; (iii) baths to infants; (iv) free distribution of milk to the deserving expectant mothers and infants, and at reduced rates to those who can afford to pay; and (v) confinements at the maternity homes.

## REPORT OF THE DIRECTOR OF MEDICAL AND SANITARY SERVICES, HONG KONG, FOR THE YEAR 1935

### GENERAL REMARKS

In the absence of some general system of registration of sickness, the only sources of information available for gauging the state of the public health in this colony are the returns relating to deaths, the notifications of infectious diseases and the records of Government and Chinese hospitals. Judging from the death returns the health of the colony was not quite so good as that of the previous year. The crude death rate was 22.90 per mille as compared with 20.93 for 1934.

Respiratory diseases accounted for 41.62 per cent of the total deaths; the percentage for 1934 was 39.97. The principal diseases causing deaths were broncho-pneumonia, pulmonary tuberculosis, bronchitis, infantile diarrhoea and dysentery.

The overcrowded houses, the expectorating habits of the people, and poverty furnish sufficient explanation for the prevalence of respiratory troubles.

*Malaria.*—This disease which in the early days of the colony was the great cause of death and from which Hong Kong derived its reputation of unhealthiness has now practically disappeared from the populous centres of Victoria and Kowloon as the result of the destruction of the breeding places of the carriers through efficient drainage. There is still some malaria in the outskirts of the two towns and a considerable amount in the rural areas of both the island and mainland.

Investigations have proved that swamps, ponds and other collections of water in the open plains are more or less harmless and that the real danger lies within mosquito flight distance of the foot of the hills and of valleys where collections of spring water in pockets, pools, swamps and streams form the breeding places of *A. maculatus*, *A. minimus* and *A. jayporiensis*.

Why it is so we do not know, but spring water which has not lost its sparkle does have an attraction for these three species. As a rule such water has a faint acid reaction due to dissolved carbonic acid gas. When it loses its CO<sub>2</sub> and becomes flat it ceases to attract.

For many years the chief vector in the colony and new territories was believed to be *A. maculatus*. *A. maculatus* is a carrier but is of far less importance in the spread of malaria than *A. minimus* and *A. jayporiensis*.

It appears that species of mosquitoes, like races of men, can under different conditions of climate and surroundings develop differences in habits and tastes for food. *A. maculatus* in Malaya readily takes human blood and is a very potent agent in the spread of malaria. In Hong Kong, where it is very prevalent, it seems to prefer animals to humans and its importance as a vector of paludism is much less pronounced.

Here as in Malaya disturbances of the soil often result in the formation of small collections of water which for reasons unknown attract the malaria mosquito and in which they deposit their eggs. The breaking of the soil is not a direct cause of malaria but a predisposing factor in a chain of events which favour the spread of the disease.

*Pulmonary tuberculosis.*—This disease continues to rank second to broncho-pneumonia as the principal cause of death. It is probable that some of the cases of the latter were of tuberculous origin. There is need for more hospital or infirmary accommodation for

tuberculosis patients, especially for those of the poorer classes.

**Smallpox.**—Every year in the cold season this disease manifests itself in outbreaks which are sometimes sporadic, sometimes epidemic. Whatever the prevalence there is always a tendency for the morbidity rate to decline or disappear with the advent of summer. In the year under review there were 61 cases and 44 deaths. Eighteen cases only were treated in hospital the remainder did not come under the notice of the authorities until after death.

The Chinese have a preference for vaccination in the spring as being the auspicious season, and for a month or two after Chinese New Year the Chinese public dispensaries are crowded with children waiting to be done.

The majority of Chinese still hold the opinion that the herbalist treatment of smallpox gives better results than the methods adopted by practitioners qualified in Western medicine. An analysis of the statistics of (a) the Tung Wah Infectious Diseases Hospital where only herbalist treatment is carried out and (b) the Government Infectious Diseases Hospital where Western treatment only is provided shows that this view is not correct. Calculating on the figures for the last 25 years the death rate at the Tung Wah was 47.2 per cent while that at the Government institution was 15.25 per cent.

**Plague.**—For the last six years no cases of plague have been reported in Hong Kong. The disappearance of this disease not only from the colony but from the greater part of China and its decline throughout the world are due to factors which are not understood.

**Cerebro-spinal fever.**—The disease is most prevalent in the cold weather. It dies down when the real summer heat sets in and people sleep more out of doors at night thus lessening overcrowding. Of the 110 cases reported, 54 or 49.09 per cent proved fatal. Ever since the severe outbreak of this disease, which occurred in 1917, a supply of serum, made at the Bacteriological Institute from the local strains of meningococcus, is kept in stock. This serum gives very good results when used early in the disease.

**Enteric.**—Cases of this disease are notified throughout the year, but there is usually some increase in the number reported during the summer months. The cases are usually sporadic and the source of infection is seldom discovered. Three hundred and nineteen cases were notified with 95 deaths as compared with 212 in 1934 with 65 deaths.

**Leprosy.**—Though leprosy is a notifiable disease very few cases are notified. The number of lepers in the colony is not known but assuming that the incidence rate is the same as that of the neighbouring countries the total number cannot be less than 500 and may approach 1,000. To many, these figures will appear to be exaggerations, nevertheless they are accepted by all who are authorities on the subject and have taken the trouble to make the necessary enquiries.

**Rabies.**—Ten cases of this disease were reported during the year. Three cases occurred in humans, the remainder in dogs. The human cases occurred in Kowloon. There were no cases on the Island of Hong Kong. Two of the human cases had been treated with anti-rabic vaccine before the appearance of the symptoms. All were fatal.

#### REVIEW OF THE REPORT ON THE WORKING OF HOSPITALS AND DISPENSARIES IN THE PUNJAB FOR THE YEAR 1935

THE financial position still remained such that there could be no expansion in medical relief during the year under report. The scheme for the provincialization of hospitals at district and *tahsil* headquarters remained at a standstill and the total number of medical institutions was practically unchanged. A new hospital was, however, constructed at Abohar and the Rai Bahadur Amar Nath Tuberculosis Institute was added to the Mayo Hospital, Lahore. The number of beds increased

by 107, and there was some increase in the number of inpatients, but the total number of patients treated decreased from 14,024,499 to 13,858,928. The main reason for this decrease appears to be that malaria was less prevalent than in the preceding year owing to diminished rainfall. A heavy call on the medical resources of the province was made as a result of the Quetta earthquake, and the department rose to the occasion in a very creditable manner. A number of medical officers, nurses and dispensers were sent to Quetta and special accommodation for patients therefrom was provided in the principal hospitals of the province. The number of dispensaries decreased by two and the development of rural dispensaries remains stationary.

The expenditure of the department increased from 47 lakhs in 1934 to 49.88 lakhs in 1935, the increase being mainly accounted for by new buildings and the annual increments of the staff. As usual little income is raised from fees, but voluntary contributions amounted to Rs. 1,49,305. Government gratefully concur with the Inspector-General of Civil Hospitals in his acknowledgment of the generous gift of Rs. 1,00,000 by Rai Bahadur Seth Kishor Chand Maheshwari of Amritsar for the establishment of a maternity home at Amritsar. Another example of local enterprise is the construction of a tuberculosis sanatorium at Samli in the Murree Hills by contributions from private persons and local bodies under the aegis of the Red Cross Society.

The Mayo Hospital, Lahore, maintained its high reputation, and had to meet the brunt of the strain on the medical resources of the province due to the influx of patients from Quetta. The late Colonel T. A. Hughes, I.M.S., ably discharged the duties of Medical Superintendent of the hospital till he was appointed Principal of the King Edward Medical College in November, 1935. It was hoped that his rare gifts would have been of special value in the latter post, but continued ill health obliged him to take leave and his subsequent death in England was a great loss to the college and the province.

The civil hospital, Amritsar, continues to be handicapped by lack of accommodation, the daily average of inpatients being far in excess of the number which it was intended to provide. It is hoped to give relief by the conversion of the old medical school building into a separate ophthalmic hospital, and the plans for the necessary alterations are under the consideration of Government. The Ripon Hospital, Simla, also suffers from the same difficulty in spite of the number of beds being raised from 56 to 70 during the year under report. The Lady Willingdon Hospital, Lahore, continues to work at full pressure and many gynaecological cases had to be refused for want of accommodation. Proposals for providing accommodation for 116 more beds are under consideration. The construction of the Teka Devi Health Centre in connection with this hospital, made possible by the generosity of Rai Bahadur Lala Amar Nath, is also now in hand. All the above-mentioned hospitals, as well as the Punjab Dental Hospital, Lahore, and the Lady Aitchison Hospital, Lahore, maintained a high standard of efficiency.

As noted in the review for the previous year, the diagnosis and relief of leprosy is engaging the attention of the medical authorities to an increasing extent, and the survey conducted under the auspices of the Punjab Branch of the British Empire Leprosy Relief Association was continued. The working of the five leper homes in the province is reputed to be extremely satisfactory and a large number of the patients treated was cured or much improved. There are also 52 leper clinics in which 578 cases were treated. The question of applying the Indian Lepers Act to the province has again been raised, but Government consider it to be impracticable at present. It has been decided, however, to proceed with a scheme for establishing a settlement for 'burnt out' cases in the Lower Bari Doab colony, to which lepers from the leper homes can be transferred, thus making room in



the homes for a greater number of active cases. The details of the scheme are under consideration.

The scheme inaugurated in 1926 for providing medical aid to women by lady doctors in separate hospitals at each district headquarters and in special female sections at each *tahsil* headquarters hospital still falls far short of achievement, but there are now 50 separate hospitals for women under the charge of lady doctors, and also 33 such doctors in charge of female sections in general hospitals. The number of beds for women increased from 3,971 in 1934 to 4,024 in 1935. At the same time there is a steady increase in the number of women doctors and the number of applicants for admission to the medical colleges and schools now exceeds the number of vacancies available. There are at present 216 women studying medicine in the various institutions, and during the year two women students qualified for the M.B., B.S. degree and 12 for the L.S.M.F. diploma. Satisfactory progress has also been made in the training of *dais* and midwives. A sum of 2 lakhs of rupees from Their Majesties' Silver Jubilee Fund has been set aside for providing a scholarship fund for the medical training of women.

#### THE SOUTH AFRICAN INSTITUTE FOR MEDICAL RESEARCH. ANNUAL REPORT FOR THE YEAR ENDED 31ST DECEMBER, 1935, JOHANNESBURG

*Department of industrial hygiene.*—The focus of interest in the matter of air-borne dust on the mines of the Witwatersrand has been influenced by the visit of Dr. W. R. Jones. It will be remembered that Dr. Jones had put forward an hypothesis to the effect that while most of the air-borne dust, and of the dust recovered from the lungs of those who have been exposed, was free silica as shown by chemical analysis, the majority of small particles was contributed by micaceous matter. It was also urged by him that it was the number of particles that was the dominant factor in injury to the lungs. The earliest analyses on dust recovered from lungs of sufferers from pneumokoniosis were performed some eighty years ago, and these and subsequent analyses had shown that while most of the dust recovered was contributed by free silica, plenty of other dusts could be recovered, and nineteenth century workers accepted many dusts as pneumokoniosis-producers. It was also held that while many dusts contributed to pneumokoniosis, it was only certain dusts that were associated with tuberculo-pneumonokoniosis, and that it was this association with tuberculosis that was the significant factor in the disablement and death of those exposed. Early in the present century, E. L. Collis was thought to have proved by statistical analysis that it was free silica that was the tuberculosis-facilitating dust, and tuberculo-silicosis became also a synonym for dust-phthisis since, previous to the systematic examination of employees started on the Witwatersrand in 1916, it was only *via* tuberculosis that a phthisis-producing industry was identified.

Dr. Jones' hypothesis has raised certain questions. Firstly, was he correct in suspecting that it was micaceous matter that contributed to the majority of the smallest particles? Investigations have shown that, down to the minimal size identifiable by petrological methods, say a trifle below two microns, the majority of our air-borne particles, and of those recovered from lungs, are particles of free silica. This does not settle the question since 70 per cent. of the particles by number both in air-borne dust and in dust recovered from lungs are of the order of one micron and less. To attack this problem it has been necessary to attempt a method of segregating dust in terms of size frequency.

Preliminary work by the Geological Survey and the Mine Air Committee is furnishing some support for Dr. Jones' view that the proportion of micaceous matter rises with diminution in size of particles.

This leads to a second question. It is fairly generally held that free silica is tuberculosis facilitating in virtue of the fact that it is slowly soluble in the lungs, and

that this silica solute depresses the lungs ability to deal with after-coming infections. Is the micaceous matter met with in the air-borne dust on the Witwatersrand also soluble and, if so, is this solute toxic? Preliminary work on material supplied by the Geological Survey suggests that this solubility is negligible.

A third question arises. It is fairly well established that particles above three microns do not play an important part in phthisis production. It is not known what may be the minimal size at which inert (insoluble) particles cease to contribute to scar-formation. It is hardly practicable to collect a sufficient quantity of particles of one micron and below for inhalation or even for injection experiments, but one is contemplating subcutaneous and intravenous injections, also abscess-fixation experiments with a view to comparing the behaviour of free silica and micaceous particles of minute size. This is an important question: should these minute particles be free silica in considerable proportion then they should contribute to injuring the lungs owing to their solubility even if they do not contribute to scar-formation. On the other hand, should they be mostly micaceous and insoluble they may be of little importance. There is no higher incidence of simple tuberculosis among Witwatersrand miners than among the rest of the population of corresponding age-periods, which suggests that free silica dust only facilitates tuberculosis *via* preliminary scar-formation, i.e., *via* a simple silicosis. One does not meet with either simple or infected silicosis in the absence of large numbers of particles, readily visible under ordinary magnifications, when examining sections of lungs unstained or after incineration on heat-resisting slides. (Magnifications of about 400 diameters.)

#### BIOCHEMICAL DEPARTMENT

As in the previous year, most of the work carried out has arisen from the native diet inquiry instituted by the Chamber of Mines.

Amongst numerous strange findings, mention may be made of a plant leaf belong to the yam family (*Dioscoreaceæ*) containing no less than forty times as much iron as spinach, whilst both the bulb and leaf of another specimen were found to be exceptionally rich in anti-scorbutic vitamin, the bulb being twice (*cf.* potato usually one-half or less) and the leaf no less than twenty-five times as rich in this substance as orange juice; however, the latter plant also possesses poisonous properties, and is only used as a food when these have been removed by special treatment.

A satisfactory feature of this study of native food-stuffs has been the encouragement and co-operation we have received from several anthropologists, who have emphasized the need for such information in connection with their own work.

Further experiments have been carried out on the composition of lucerne and its suitability for human consumption, and a report on some of the conclusions arrived at has been published. Several mines are now including the plant as part of their vegetable ration, and larger amounts have been tried out in certain mine hospitals where it has been possible to study the absorption of the antiscorbutic factor by the individuals consuming the lucerne. Dried preparations of the leaves have also been further investigated; one prepared commercially by a special process contained 1.6 mg. ascorbic acid per gramme, whilst another was as high as 3.5. The former meal has been tried out with promising results in two country native hospitals, where inexpensive antiscorbutics were practically unobtainable.

Merely from the nutritional point of view there can be no doubt that lucerne occupies a somewhat exceptional place, being remarkably rich in vitamins A and C, minerals and protein; however, either eaten raw or cooked as a spinach, it is apt to be somewhat fibrous unless obtained really young and fresh. Nevertheless, the plant is so hardy and so widely grown throughout the Union, that it may well be regarded as an emergency foodstuff of considerable value which will improve the

nutritional qualities of a ration at very low cost; moreover, the leaves, when specially dried, provide a highly concentrated source of the antiscorbutic vitamin which has the further advantage of being easily transported to areas where fresh fruit or vegetables are temporarily unobtainable.

*Winter malaria.*—A great deal of investigation has been carried out regarding the winter carriage of malaria in Natal.

The work included spleen surveys and the dissection of mosquitoes.

The results indicated a complete cessation of mosquito-borne malaria in winter in 'A. gambiae' areas, and that malaria is carried over from one season to another in the human host. It is suggested that the treatment of malaria in winter by the administration of

quinine or other drugs would probably have a great effect on the incidence of the disease in such areas. Notwithstanding the above expression of opinion the possibilities of a low mosquito infection, in winter in 'A. gambiae' areas along the coast cannot be dismissed entirely because of the higher humidity of the air enabling *A. gambiae* to remain in habitations which is contrary to their behaviour in the more arid inland regions, and where the dryness of the air is such that although they may breed in winter they do not remain indoors.

With regard to *A. funestus* the results of investigation suggested a low, or no infection, rate among these mosquitoes in winter, plus a carry over in the human host; therefore both treatment of malaria and anti-mosquito measures are indicated.

## Service Notes

### APPOINTMENTS AND TRANSFERS

*To be Officiating Deputy Director, Medical Services, Northern Command:*—

Colonel W. H. Hamilton, C.I.E., C.B.E., D.S.O., K.H.P., *vice* Major-General A. W. M. Harvey, K.H.S., on combined leave. Dated 21st October, 1936.

Lieutenant-Colonel J. C. De, Superintendent, Campbell Medical School and Hospital, Calcutta, is appointed to act, until further orders, as Principal, Medical College, and Superintendent of the Medical College Hospitals, Calcutta, *vice* Lieutenant-Colonel T. C. Boyd.

Lieutenant-Colonel P. Banerji, on general duty at the Medical College Hospitals, Calcutta, is appointed to act, until further orders, as Superintendent, Campbell Medical School and Hospital, Calcutta, *vice* Lieutenant-Colonel J. C. De.

Lieutenant-Colonel J. Rodger, M.C., an Agency Surgeon, is appointed to officiate as Civil Surgeon, Sibi and Loralai, in addition to his own duties as Residency Surgeon and Chief Medical Officer in Baluchistan, with effect from the afternoon of the 7th October, 1936.

Lieutenant-Colonel P. F. Gow is confirmed in the post of Professor of Midwifery, Medical College, Calcutta, with effect from the 28th July, 1935.

In supersession of previous notification, the services of Major W. H. Crichton, Health Officer, Simla, are placed temporarily at the disposal of the Chief Commissioner, Delhi, for *Assistant Director of Public Health, Delhi, and Health Officer, New Delhi, and Health Officer, Area Committee, Civil Lines, Delhi*, on probation for 1 year, with effect from the afternoon of the 30th September, 1936.

Major S. Smyth is appointed to officiate as Civil Surgeon, Simla East, *vice* Lieutenant-Colonel B. Gale, granted leave.

The services of Major H. Williamson, O.B.E., an Agency Surgeon, are temporarily placed at the disposal of the Government of Bombay, with effect from the afternoon of the 7th October, 1936.

On reversion from foreign service under the Indian Research Fund Association, the services of Major R. C. Wats, an Officer of the Medical Research Department, are placed temporarily at the disposal of the Government of Bombay for appointment as Officiating Assistant Director, Haffkine Institute, Bombay, with effect from the date on which he relinquishes charge of his duties.

The Secretary of State for India in Council has appointed to the Civil Branch of the Indian Medical Service the following officers of the Indian Medical Service, with effect from the dates noted against their names:—

- (1) Major W. Lawie. Dated 3rd July, 1935.
- (2) Major R. L. Frost. Dated 26th July, 1935.

(3) Captain P. H. Cummins. Dated 13th October, 1935.

(4) Captain W. Scott. Dated 15th October, 1935. In supersession of previous notification, Captain C. J. H. Brink is appointed temporarily as Air Port Health Officer, Karachi, on probation, with effect from the 23rd December, 1935.

In supersession of previous notification, the services of Captain J. P. J. Little are placed temporarily at the disposal of the Government of the Punjab, with effect from the 30th August, 1936.

Captain J. R. Dogra, Officiating Assistant Director, Haffkine Institute, Bombay, is placed on foreign service under the Indian Research Fund Association, with effect from the date on which he relinquishes charge of his duties.

Captain E. G. Montgomery, Civil Surgeon, Midnapore, is appointed as Civil Surgeon, Jalpaiguri, *vice* Captain H. A. Young, granted leave preparatory to retirement.

### *To be Lieutenants (on probation)*

Stuart Cordingley Colbeck. Dated 1st September, 1936, with seniority 1st September, 1935.

John Herbertson Bowie. Dated 1st September, 1936, with seniority 1st September, 1935.

William Stewart Empey. Dated 1st September, 1936, with seniority 1st September, 1935.

Alastair Gowans Miller. Dated 1st September, 1936.

James Ford Thomson. Dated 1st September, 1936.

William Allen Hopkins. Dated 1st September, 1936.

Lieutenant E. H. Wallace is restored to the establishment. Dated 1st October, 1936.

### LEAVE

Lieutenant-Colonel B. Gale, Civil Surgeon, Simla East, is granted leave up to the 21st March, 1937, with effect from the 3rd November, 1936, or subsequent date from which he may avail himself of it.

Lieutenant-Colonel M. Das, M.C., Superintendent, Alipore Central Jail, is allowed leave, from the 2nd January, 1937, to the 16th January, 1937, both days inclusive.

### PROMOTIONS

#### *Major to be Lieutenant-Colonel*

R. S. Aspinall, C.I.E. Dated 19th October, 1936.

#### *Captain to be Major*

A. N. Chopra. Dated 17th October, 1936.

#### *Lieutenant (on probation) to be Captain (on probation)*

C. W. A. Searle. Dated 26th June, 1936.

The seniority of Lieutenant A. G. Miller is antedated to the 1st September, 1935.

The seniority of Lieutenant J. F. Thomson is antedated to the 17th March, 1936.



## RETIREMENTS

Lieutenant-Colonel J. A. A. Kernahan. Dated 1st September, 1936.

Lieutenant-Colonel C. McIver, on account of ill health. Dated 2nd October, 1935.

Lieutenant-Colonel D. Coutts. Dated 1st September, 1936.

## Notes

## ANTIPLHLOGISTINE

THIS is the time of year when pneumonia, influenza and other acute infectious fevers have their greatest incidence.

At the first sign of a 'chill', or if sore throat be present, the application of Antiphlogistine is one of the best safety-first measures.

Not only does it help to ameliorate the local conditions, but it may be the means of inhibiting the onset of more serious consequences. However, if pneumonia, bronchitis, or influenza supervene, Antiphlogistine helps to moderate the severity of the attack.

Antiphlogistine relieves congestion, eases pain and promotes comfort. The heat which it supplies over a period of many hours penetrates the tissues, encouraging the more rapid absorption of toxic products and the stimulation of a more active healing process.

It is especially valuable in the treatment of respiratory affections.

## LONDON MEDICAL EXHIBITION

New Hall, Royal Horticultural Society,  
Westminster, S.W.1, 19th to 23rd October, 1936

THE Burroughs Wellcome and Co. exhibits again bore evidence on every side of the scientific resources of the firm and the continuous research work carried out. Amongst recent introductions, mention may be made of 'Stypven', Russell viper venom, described as the most efficient haemostatic available; 'Ryzamin-B', which consists of the concentrated and purified vitamin-containing fraction of rice polishings, having a potency of not less than 50 International Units of vitamin B<sub>1</sub> per gramme; and 'Eulykol' phenylethyl esters of a selected fraction of the acids of hydnocarpus oil, introduced for the treatment of lupus vulgaris. The section devoted to insulin included a display illustrating stages in the manufacture of 'Wellcome' Insulin, which is made with crystalline insulin of 100 per cent purity. Ergot preparations occupied a prominent place, and were represented by Ergometrine, the recently-discovered water-soluble alkaloid, and Ergotoxine ethanesulphonate, which was originated and introduced by Burroughs Wellcome and Co. The pioneer work accomplished by the firm in connection with digitalis was exemplified by Digoxin, a pure, stable, crystallized glucoside, isolated from the leaves of *Digitalis lanata*. Preparations of *Digitalis purpurea* included 'Diginutin', a stable solution of the total glucosides of the leaf (physiologically standardized); 'Tabloid' digitalis leaf and 'Wellcome' tincture of digitalis. In addition to vitamin concentrates such as 'Ryzamin-B', 'Tabloid' carotene, 'Tabloid' ascorbic acid and 'Tabloid' calciferol, prominence was given to 'Kepler' cod liver oil with malt extract, which continues to meet the modern demand for a natural vitamin-containing product. A wide range of serological products was exhibited. These are prepared at the Wellcome Physiological Research Laboratories, Beckenham, Kent, and include 'Wellcome' concentrated diphtheria antitoxin-globulins; diphtheria prophylactics (four types are issued); 'Wellcome' concentrated streptococcus antitoxin (scarlatina) globulins; 'Wellcome' concentrated staphylococcus antitoxin-globulins; 'Wellcome' staphylococcus toxoid for active

immunization; 'Wellcome' anti-pneumococcus sera; and preparations for carrying out Dick and Schick testing. Specimens of the wide range of 'Tabloid' medicine chests and cases, and of 'Agla' hypodermic apparatus were an important feature of the exhibits.

## COW AND GATE FEEDS ROYAL BABIES

THE following interesting intimation, addressed to Messrs. Cow and Gate Limited, has just been received



from the Private Secretary to His Majesty King Ghazi of Iraq, dated 24th September, 1936, from the Royal Palace, Diwan, Baghdad:—

'I have the honour to inform you that His Majesty, my Sovereign, has been graciously pleased to grant you the title of "Purveyors to the Royal Palace" in respect of your product Cow and Gate on which His Royal Highness the Crown Prince Faisal is being fed, in appreciation of the good quality of your said product. The respective Royal Warrant will be sent to you in due course.

RUSTAM HAIDAR,  
Private Secretary to His Majesty.'

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## Original Articles

### RADIOLOGY OF THE HEART AND GREAT VESSELS

By J. A. SHORTEN, M.B., B.Ch., M.R.C.P. (Lond.),  
B.A.O. (R.U.I.)

LIEUTENANT-COLONEL, I.M.S. (Retd.)

Calcutta

#### Part I

##### THE NORMAL HEART

THE methods used in  $x$ -ray examination of the heart and great vessels of the thorax include fluoroscopy and radiography, measurement of the cardiac diameters, and special observations after a 'barium swallow'.

Owing to the divergence of the rays from the anode of the  $x$ -ray tube, there is much distortion of the image if the tube is close to the chest; so, to get an accurate representation of the size of the heart, films should be taken at a distance of six feet, or the actual size of the heart may be mapped out on the screen by cutting down the diaphragm to give an image of the heart border on the screen about the size of a postage stamp, thus using the central ray to delineate the outline of the heart shadow. Other procedures such as cinematography and kymographic analysis of the heart movements have not reached such a stage of perfection as to justify their general use. Similarly, stereoscopic films do not help.

#### METHODS IN USE

##### I. Fluoroscopy

Great importance is now attached to this procedure, especially by British radiologists, who place greater reliance on personal screen examinations than on any of the various systems of measurements.

The procedure to be adopted is as follows :—The patient is placed standing in the postero-anterior position behind the fluorescent screen. A rapid survey of the cardiac silhouette is made in inspiration and expiration; the movements of the diaphragm and the condition of the cardio-phrenic and costo-phrenic angles are noted. An experienced observer can tell at once whether the heart is enlarged or not. The presence or absence of aneurysm of the heart or aorta can usually be quickly determined. Any abnormal bulging or pulsation should be noted. A preliminary opinion can usually be given as to what cavities are enlarged and a provisional diagnosis made. The tone of the heart muscle, and whether it lifts well from the diaphragm, should next be observed.

The lung fields are then scanned for any abnormality, enlargement of the hili and opacities in the lung fields due to congestion are noted. Enlarged and pulsating branches of the

pulmonary artery, indicating disease of the pulmonary arterial system, may be seen.

The patient is then slowly turned into the right oblique position (right side of the chest in contact with the back of the fluorescent screen) while a watch is kept on the borders of the heart and the great vessels. The movement should be continued until the retro-cardiac space assumes its maximal illumination on deep inspiration. This is the best position for examining the ascending aorta and left auricle. The left auricle occupies the upper two-thirds of the posterior border of the heart in this position and any enlargement backward should be noted. The posterior boundary of the retro-cardiac space is formed by the descending aorta. This is not usually seen on the screen; but aneurysm or calcification in its walls may make it visible.

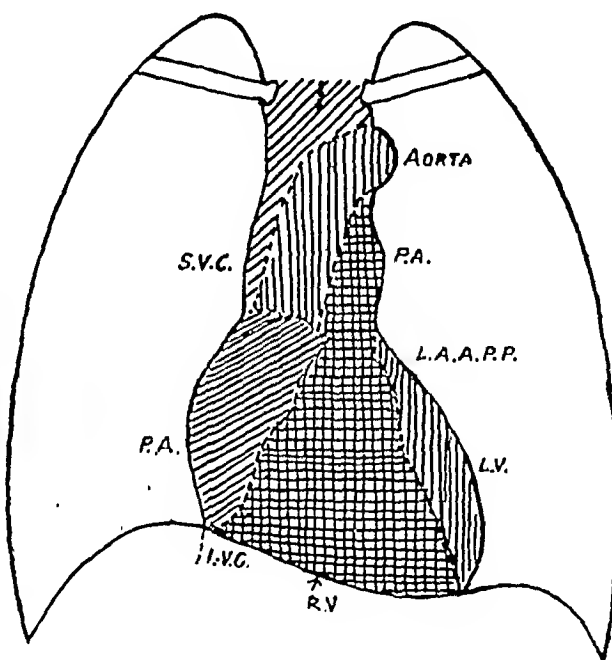


Fig. 1.—Antero-posterior view.

The ascending aorta, which here has the translucent trachea on one side and the lung on the other, now claims attention. Increase in its diameter, bulging or abnormal density should be noted.

The patient is now turned into the left oblique position (left side of chest in contact with the back of the fluorescent screen). In this the posterior border of the heart, composed of the left ventricle below and the left auricle above, is inclined to overlap the anterior border of the spinal column and the patient should be turned sufficiently to clear this on deep inspiration.

The arch of the aorta lies transversely just below the shadow of the clavicle with a triangular translucent space below, between it and the pulmonary artery, which can be faintly seen. Any increase in the diameter of the aorta or increased density should be noted. In

this position the arch of the normal aorta forms a definite curve and a note should be made of any unfolding such as is seen in hyperpiesis. Also, as the anterior border of the heart here is formed of the right ventricle, a distinction can be made between enlargement of the right and left ventricle. The pulsations of the left ventricle should be carefully observed when infarction is suspected, as this condition may lead to immobilization of the affected part of the wall, or even an inward movement as the ventricle expands.

Finally, a look at the lateral view should be taken. The heart here lies at an oblique angle with the apex anteriorly, and the base above near the spine. There is a triangular space between the heart in front, the spine behind and the diaphragm below, and a similar clear

aortic arch or pulmonary artery these indentations are greatly increased. Enlargement of the left auricle may result in a large backward displacement of the oesophagus below the indentations due to the aorta and pulmonary artery.

To make a permanent record the screening set must have a tube that can be moved independently of the screen. The diaphragm is cut down to give a small central ray which is worked round the outline of the heart while the observer traces the silhouette with a grease pencil. This image can then be transferred to tracing paper.

## II. Orthodiagraphy

If the special apparatus is available an orthodiagram may be made in a similar manner.

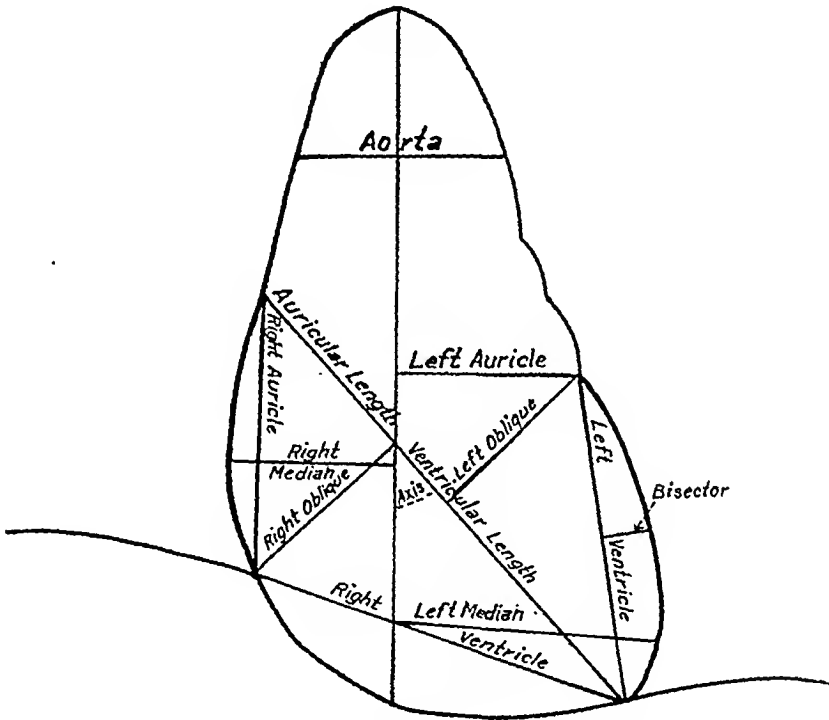


Fig. 2.

space between the heart and sternum in front. The left auricle forms the posterior boundary of the heart shadow, while the anterior border is composed of the superimposed shadows of the ventricle below and the base of the aorta above.

The patient is now turned into the right oblique position and given an ounce or so of thick barium emulsion to swallow. As it passes down, its course, outlining the oesophagus, is observed. Normally, there is a little delay on reaching the aortic arch and there is a slight indentation corresponding to this structure, just below there is another indentation due to the pulmonary artery. From here the barium shadow passes straight down to the level of the diaphragm. When there is enlargement of the

Care must be taken to mark the outline in diastole and in the same phase of respiration. This constitutes the chief difficulty and introduces the personal factor.

## III. Teleradiography

Teleradiograms at two meters give a sufficiently accurate representation of the heart shadow for all practical purposes, besides giving a permanent record and eliminating the dangers of prolonged screening.

For a complete examination, skiagrams should be taken in the four positions used in screening. It will be found convenient to take oblique pictures just on completing the screen observation of the 'barium swallow', in the right oblique position. The tube is moved back to

the two meters' distance, the patient is given another mouthful of emulsion and a skiagram taken on swallowing, with the breath held in deep inspiration. The left oblique and lateral views are similarly dealt with. Finally, a postero-anterior skiagram is taken.

### (1) *Postero-anterior view*

This is a standard position for a general view of the chest. In this position the left border of the cardio-vascular shadow is formed from above downwards by, (a) the aortic knuckle or knob, being the left border of the terminal part of the arch of the aorta; this curve is exaggerated in arterio-sclerosis, dilatation and aneurysm, (b) a less obvious curve due to the pulmonary artery; this is accentuated when pressure in the pulmonary artery is raised as in

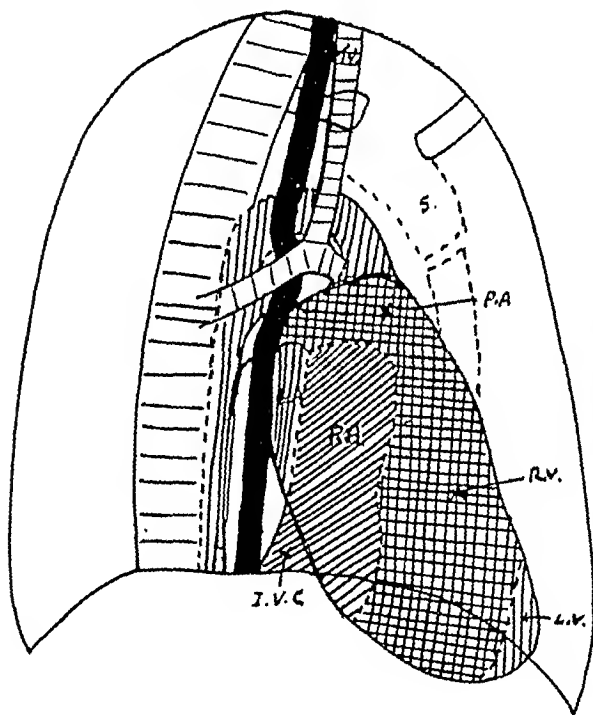


Fig. 3.—Right oblique.

mitral stenosis, patent ductus arteriosus and pulmonary stenosis; on the screen the enlargement will be seen to pulsate synchronously with the aorta, (c) the tip of the auricular appendix; this is not usually seen unless there is enlargement of the left auricle, as in mitral stenosis, (d) the left margin of the left ventricle continuing the heart border down to the diaphragm. The right border is formed by the right margin of the superior vena cava above and the right auricle below. In patients of the hyposthenic habitus the heart shadow is long, narrow and central, while in the hypersthenic subject the heart shadow is broader and shorter. The right ventricle forms most of the shadow as seen from the front.

Cardiac measurements are usually carried out on skiagrams taken in this position. Many

schemes have been devised, but I will only describe the one used in my own practice. This is based on the work of Vaquez and Bordet. The two-meter skiagram is taken in full inspiration. The following lines are drawn on the heart shadow:—

(i) *Mid-line*.—A vertical line through the centre of the shadows of the spinous process.

(ii) *Transverse diameter*.—Perpendiculars to this from the point of greatest width of the heart shadow on the right and on the left. These give the right and the left median diameters, the sum of which is the transverse diameter of the heart. Normal: 14.5 to 9.5 cm.

(iii) *Length*.—A line from the point where the vascular shadow crosses the diaphragm, the usual situation of the apex, to the junction of the right auricle and the ascending aorta. This

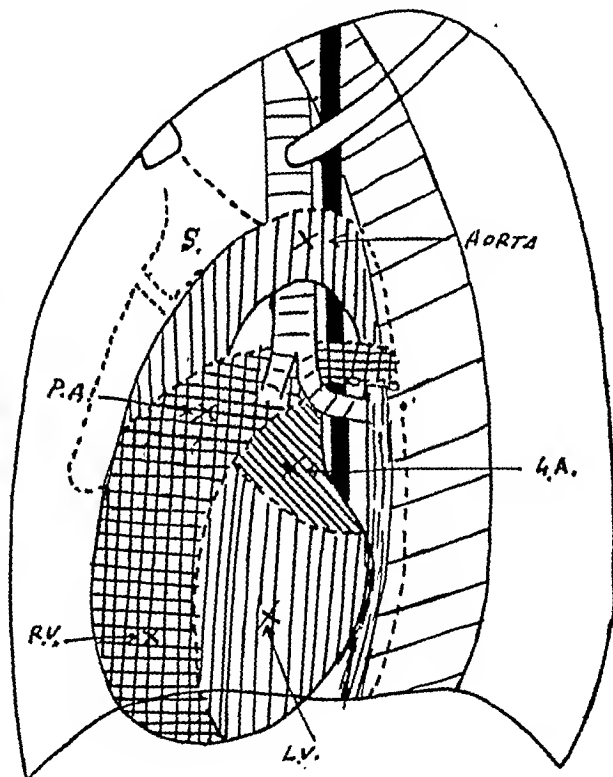


Fig. 4.—Left oblique.

determines the length of the heart. Normal: 15.0 to 11.5 cm. The angle formed by this line with the mid-line shows the degree of rotation of the heart on its vertical axis, the greater the angle the further out will be the apex, so that mere displacement may be distinguished from enlargement. Normal: 15.0 to 11.5 cm.

(iv) *Oblique diameter*.—Lines dropped perpendicularly to the length of the heart from the junction of the left auricle and ventricle (node of no motion), and from the cardio-hepatic angle form the right and left oblique diameters, the sum of which is the oblique diameter of the heart. Normal: 10.5 to 9.3 cm.

(v) *Index of auriculo-ventricular ratio*.—This is determined by bisecting the length of the heart by a line joining the cardio-hepatic angle

on the right and the auriculo-ventricular junction on the left. The value of the upper segment (auricular) is divided by the value of the lower segment (ventricular) and the result for normal hearts is found to vary between 0.534 and 0.704. In ventricular preponderance this figure may fall to 0.200. In auricular preponderance, on the other hand, the figure may rise to 1.2.

(vi) *Left ventricle*.—A line joining the apex with the auriculo-ventricular junction on the left gives a measure of the size of the left ventricle. Normal: 8.5 to 6.7 cm. A perpendicular to this line at the point of maximum thickness establishes a bisector of its arc, and represents the thickness of the ventricular wall. Normal: 0.6 to 2.0 cm. The bisector is increased in ventricular hypertrophy.

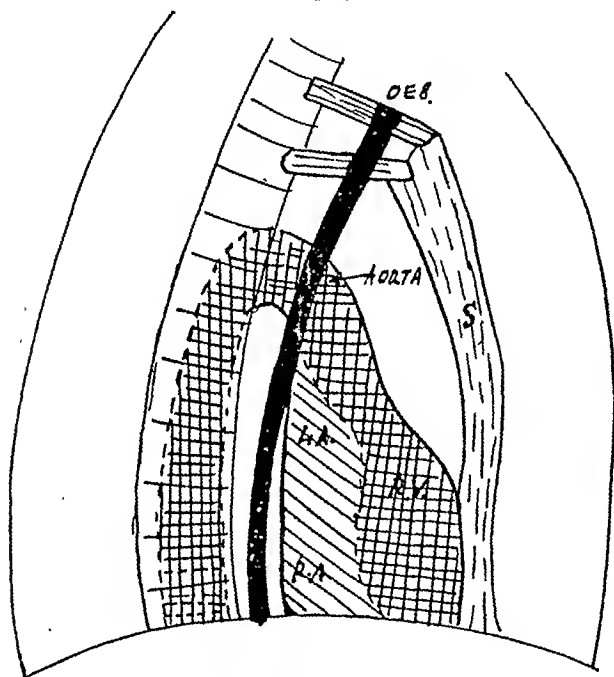


Fig. 5.—Lateral.

(vii) *Left auricle*.—A perpendicular from the auriculo-ventricular junction on the left side to the mid-line gives a measure of the left auricle. Normal: 5.0 to 3.5 cm.

(viii) *Right ventricle*.—A line joining the cardio-hepatic angle and apex measures the size of the right ventricle. Normal: 14.7 to 8.5 cm.

(ix) *Right auricle*.—A line joining the point of junction of the right auricle and vascular arch with the cardio-hepatic angle represents the size of the right auricle. Normal: 6.5 to 3.5 cm.

(x) *Aorta*.—This is usually measured by a transverse line drawn at the widest part of the arch usually at the level of the third intercostal cartilages. Care should be taken to exclude the superior vena cava on the right. Normal measurements are 3.9 to 5.7 cm.

These measurements help considerably in determining what chambers of the heart are responsible for a particular picture of cardiac enlargement.

In addition to the above measurements an estimation of the cardio-thoracic ratio is useful. By this we mean the ratio of the transverse diameter of the heart to the internal diameter of the chest. In people of normal build this should not be more than 1:2, hyposthenic individuals may have a ratio of 1:4, and in hypersthenic people the ratio may be as low as 1:1.9.

The transverse extent of the heart shadow of course varies with the phase of respiration; but most authorities are now in favour of measurements in full inspiration.

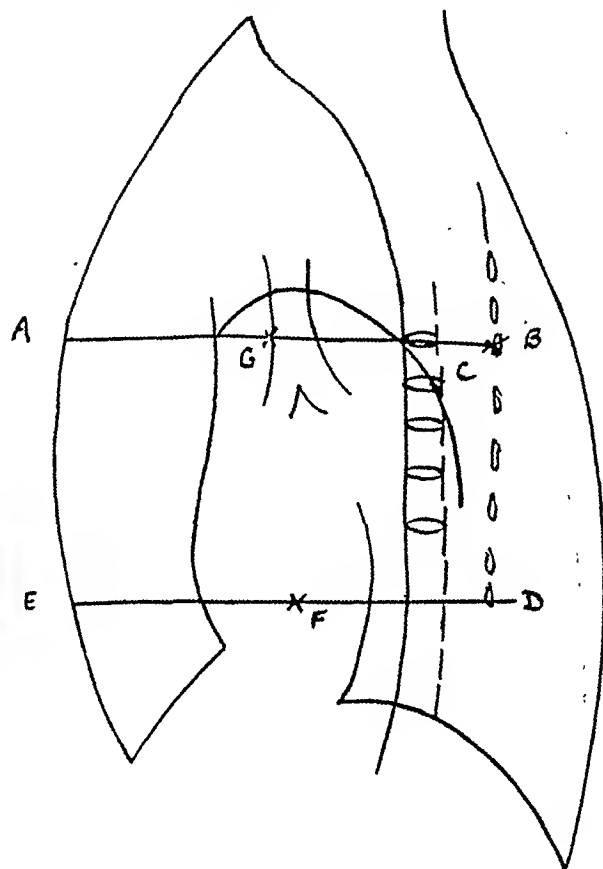


Fig. 6.—Left oblique—measurements.

The width of the aortic knuckle may be measured by giving the patient some barium emulsion to swallow, while a skiagram is taken in the antero-posterior position. A horizontal line drawn from the indentation, where the oesophagus crosses the arch, to the point of maximum convexity of the knuckle gives the width of the knuckle. This should not exceed 3.2 cm.

The ascending aorta can also be measured in the right oblique position where it is seen between the trachea and the lung. This measurement should not exceed 3.5 cm.

## (2) *Right anterior oblique position*

This is the position for examining the ascending aorta and left auricle and their relations to the trachea and the oesophagus filled with barium.

The left border of the heart shadow in this position is formed from above downwards by the arch of the aorta, pulmonary artery, right ventricle, and near the apex the left ventricle. The trachea lies in front of the arch, the left bronchus passes behind the ascending aorta and the right bronchus in front of the descending aorta. The barium-filled œsophagus passes in front of the arch and pulmonary artery, being indented by both.

The right border of the heart shadow is formed by the left auricle above and the inferior vena cava below. In the correct position, the right auricle does not enter into it. Behind the border lies the retro-cardiac space, bounded behind by the descending aorta which is not usually seen unless atheroma or aneurysm is present.

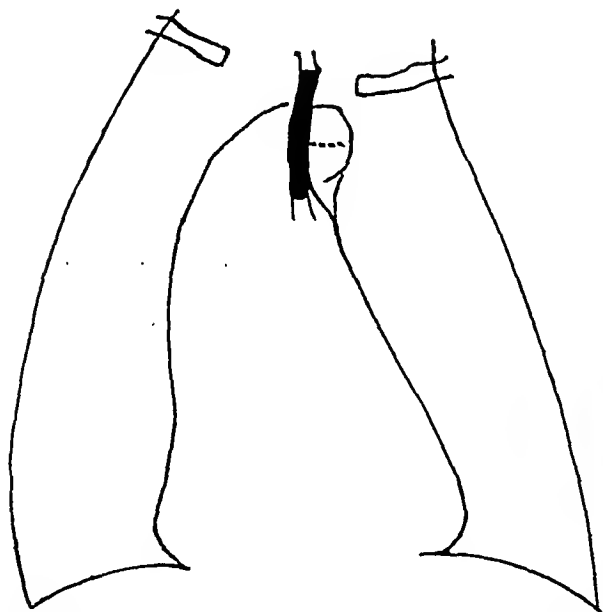


Fig. 7.—Inner border posterior part of arch outlined by barium in œsophagus.

### (3) *Left anterior oblique position*

The heart and descending aorta now lie to the right of the spine and descending aorta, and therefore cross in front of the shadows of the trachea, œsophagus and right bronchus. The left bronchus passes in front of the descending aorta and pulmonary artery.

The arch of the aorta is seen passing transversely, and below this the pulmonary artery. The translucent trachea makes the latter transparent; it is not distinctly seen unless diseased. The posterior border of the heart is formed by the left auricle above and the left ventricle below. The anterior border comprises the ascending aorta above and the right ventricle below. With the patient at an angle of  $45^\circ$ , when the transverse diameter is at its minimum, the inter-ventricular septum will be midway between the front of the chest and the point where the ribs articulate with the spine. Also the transverse diameter of the normal heart at

this angle is half the distance between the front of the chest and the posterior articulations of the ribs with the spine. If this ratio is less than 1 : 1.9 the heart is enlarged.

The position of the inter-ventricular septum can be fixed as follows: A mark is made on the anterior margin of the trachea at the level of the bifurcation. The distance of this from the anterior border of the chest is measured and laid off on the horizontal line through this point backward. The second mark should be just beyond the spine. A second horizontal line of equal length is drawn through the widest part of the shadow at the base. The mid point of this line marks the position of the inter-ventricular septum. Measurements to the anterior and posterior borders of the heart shadow will now give the relative size of the right and left ventricles. Neither should exceed one quarter of the internal diameter of the chest in this position. This is probably the best method for measuring enlargement of one ventricle.

### (4) *Lateral view*

This has been described already under fluoroscopy; so attention need only be called here to the course of the barium-filled œsophagus, which describes a long curve with the convexity backwards following the course of the spine in its upper third, but coming forward in its lower third to reach the œsophageal opening of the diaphragm. There are no local indentations such as are seen in the postero-anterior and right oblique positions.

This view is most valuable for showing enlargement of the descending aorta and left auricle.

## Part II

### THE PATHOLOGICAL HEART

*Dilatation and hypertrophy.*—Both these conditions lead to enlargement of the heart as a whole, or of individual chambers. The following classification after Parkinson gives a general idea of the significance of enlargement of individual chambers, as well as general enlargement:—

#### (1) *Left ventricle*

- (a) Aortic stenosis or incompetence.
- (b) Hypertension.

#### (2) *Right ventricle*

- (a) Mitral stenosis.
- (b) Congenital malformations (Fallot's tetralogy).
- (c) Chronic pulmonary diseases, and disease of the pulmonary artery.

#### (3) *Left auricle*

- (a) Mitral stenosis.



(4) *Right auricle*

- (a) Mitral stenosis.
- (b) Congenital malformations (patent auricular septum).
- (c) Tricuspid stenosis.

(5) *Pulmonary artery*

- (a) Mitral stenosis.
- (b) Congenital diseases (patent ductus arteriosus).
- (c) Chronic pulmonary diseases and disease of the pulmonary artery.
- (d) Toxic goitre.

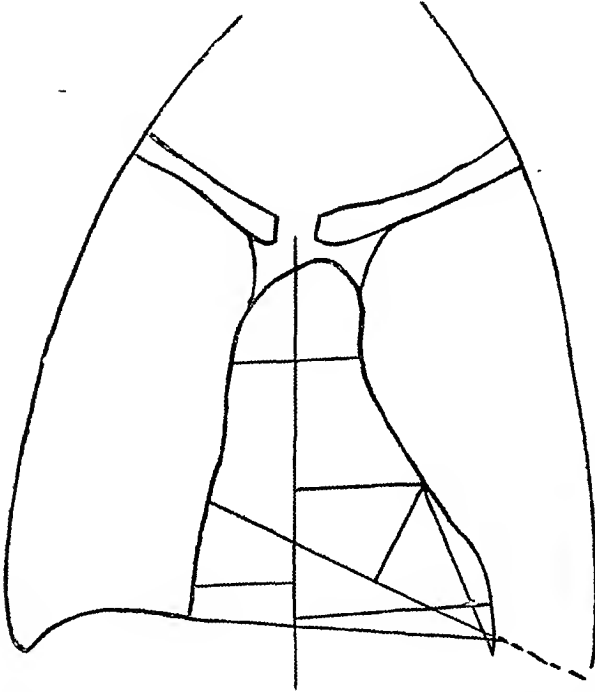


Fig. 1.—*Mitral insufficiency.* The left median diameter shows greatest change due to enlargement of the left ventricle and lateral displacement of the apex by an enlarged right ventricle. The low index of auriculo-ventricular ratio shows preponderant ventricular enlargement.

(6) *Aorta*

- (a) Syphilitic aortitis—aneurysm.
- (b) Atheroma.
- (c) Hypertension.

(7) *General enlargement*

- (a) Pericardial adhesions.
- (b) Rheumatic disease.
- (c) Aortic incompetence with mitral stenosis.
- (d) Myocardial disease.

Having grasped the significance of the above it will now be convenient to discuss the radiological findings in the commoner diseases and abnormalities of the heart.

*Valvular lesions*

**Mitral stenosis.**—The 'back-pressure' theory, although not accepted by all, offers the most intelligible explanation of the clinical and pathological findings in this disease.

Narrowing of the mitral orifice causes increase of pressure in the left auricle which

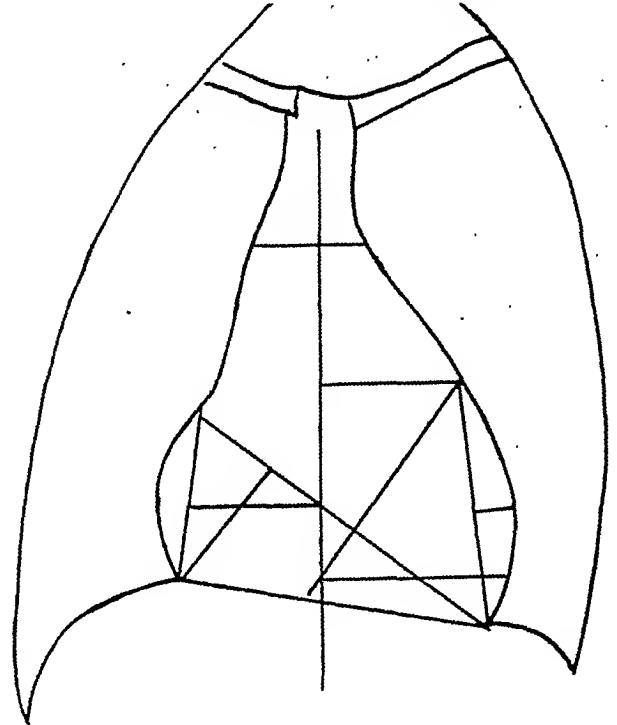


Fig. 2.—*Mitral stenosis and insufficiency—the typical 'mitral heart'.* Note how this combines the characteristics of the two lesions.

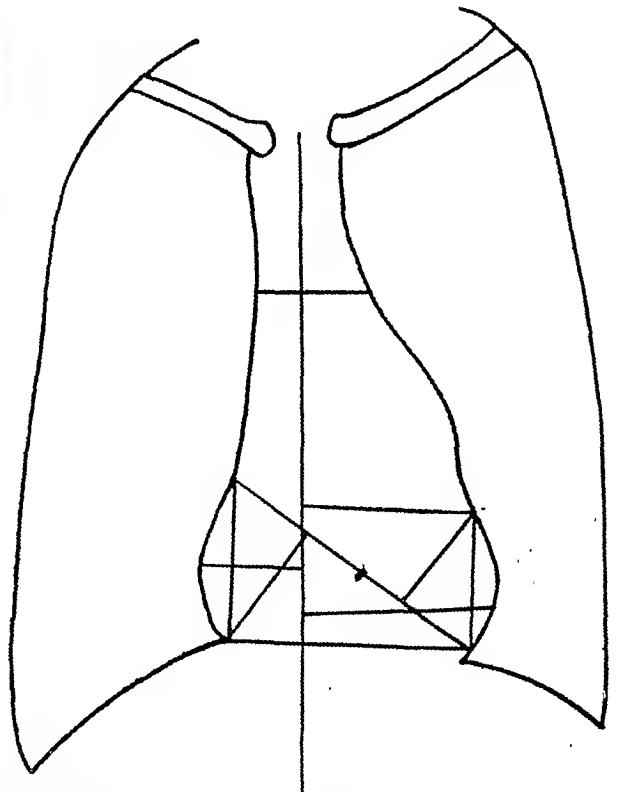


Fig. 3.—*Mitral stenosis with beginning insufficiency (child aged twelve).* Transverse diameter of heart 10.5 cm., pulmonary field 23 cm., showing uncertainty of the 'cardio-thoracic ratio' as a diagnostic criterion. Note the prominent auricles and high index of auriculo-ventricular ratio typical of mitral stenosis and the rounding and elevation of the apex due to insufficiency.

dilates; the blood is then backed up through the pulmonary vessels to the lungs causing congestion (brown induration). This is communicated through the right ventricle to the right auricle, which having a thin wall also dilates. The left ventricle on the other hand, owing to a diminished supply of blood, actually shrinks.

The x-ray findings therefore are:—

#### Screen examination

(a) Enlargement of both auricles in the postero-anterior view; in extreme cases both the left auricle and the right auricle may be seen on the right border of the heart silhouette, and the enlarged pulmonary artery and conus of the right ventricle on the left border.

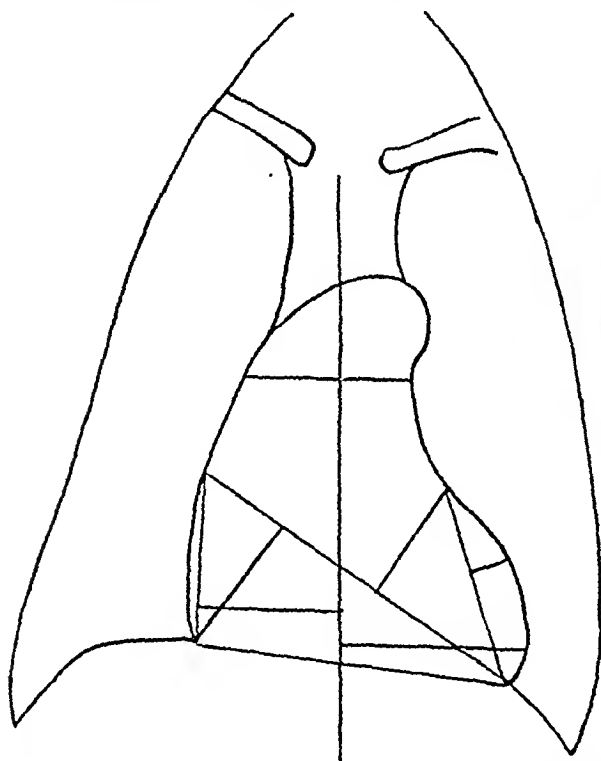


Fig. 4.—Aortic stenosis. Hypertrophy and dilatation of the left ventricle, with slow vigorous contractions of the heart and diminished aortic pulsations.

(b) In the right anterior oblique view with a 'barium swallow' the indentations caused by the enlarged pulmonary artery and left auricle are well seen.

*Teleoroentgenogram.*—One notes the prominence of the auricles—high auriculo-ventricular ratio (0.750 to 1,000)—rounding and elevation of the apex. For average measurements see table.

*Mitral insufficiency.*—The pathology here is due to an incompetent mitral valve allowing regurgitation of blood into the left auricle which dilates; a left ventricle which, owing to increased work, first hypertrophies and then as failure supervenes dilates. The resulting increased pulmonary resistance causes dilatation of the right ventricle.

The x-ray findings are:—

#### Screen examination

*Postero-anterior view.*—Enlargement of the left auricle and both the ventricles, and lateral

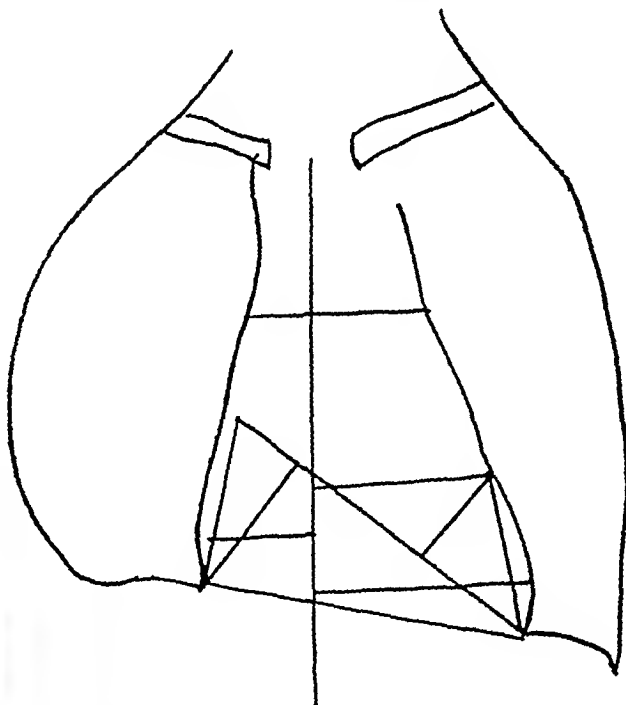


Fig. 5.—Aortic insufficiency. Note the increase in the length of the heart due to left ventricular enlargement. The heart shadow is centrally placed and the apex is lowered. The aortic width is increased. Pulsations of the heart and aorta are of increased amplitude.

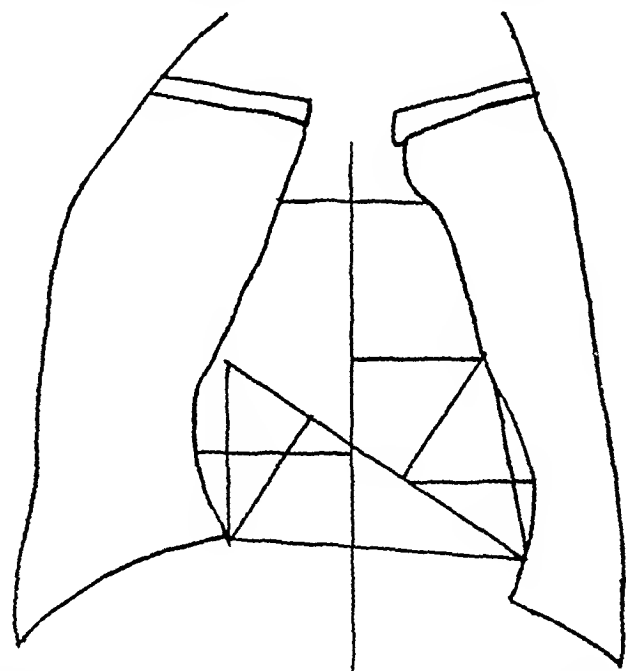


Fig. 6.—Pulmonary stenosis. Characterized by increased prominence of the shadow of the pulmonary artery and enlargement of the right side of the heart. Note that the left ventricle is not enlarged, but the apex is elevated by a hypertrophied right ventricle.

displacement of the apex by the enlarged right ventricle.

*Right anterior oblique view.*—With a 'barium swallow' this shows backward displacement of the œsophagus due to the enlarged left auricle. *Teleoroentgenogram*—shows increased values for the left auricle, ventricle and transverse diameter of the heart with a low A. V. ratio (less than 0.500)—ventricular preponderance. For average measurements see table.

*Double mitral lesions.*—These combine the characteristic of mitral stenosis and insufficiency and the heart silhouette will be the resultant of the relative prominence of the two lesions.

*Screen examination*—will show general enlargement of the shadow due to increase in the size of both auricle and ventricles. Examinations in the right anterior oblique position with 'barium swallow' will show enlargement of the left aurifice.

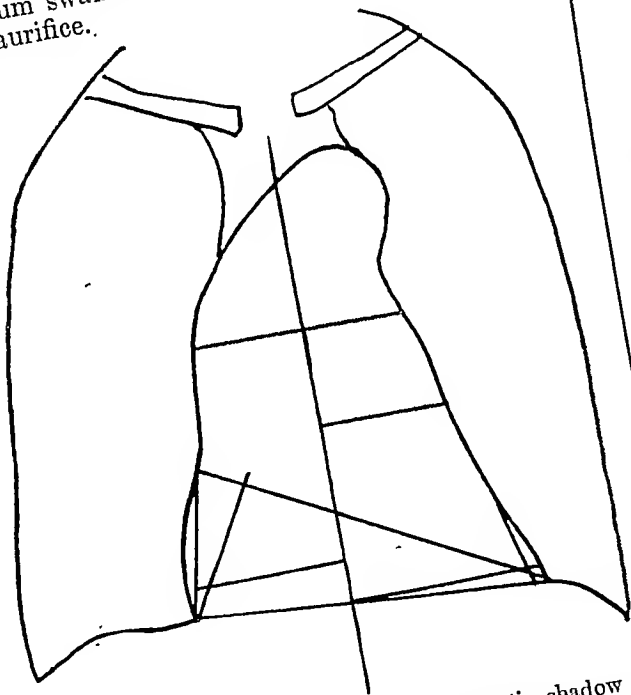


Fig. 7.—Aortitis. Increased width of aortic shadow to the right and to the left. The 'knob' is flattened and broadened. Roentgenoscopically pulsations are of increased amplitude.

*Teleoroentgenogram.*—This will show increase in the right and left median diameters and the measurements of the respective cavities. The A. V. ratio may be normal depending on the prominence of mitral stenosis or insufficiency. For average measurements see table.

*Tricuspid insufficiency.*—This is rare as a single lesion. It is usually found in association with disease of the left side or congenital defects.

The general size of the heart is increased and the measurements of the right auricle are particularly affected. The medium diameters are increased and the apex displaced to the left. The lung fields are congested and the right diaphragm is high, due to hepatic congestion. For average measurements see table.

*Aortic insufficiency.*—The characteristic signs in this condition are :—(1) Enlargement of the left ventricle and (2) increased width of the aorta. When the mitral orifice is stretched to a point which admits of mitral regurgitation the signs of mitral insufficiency are superimposed,

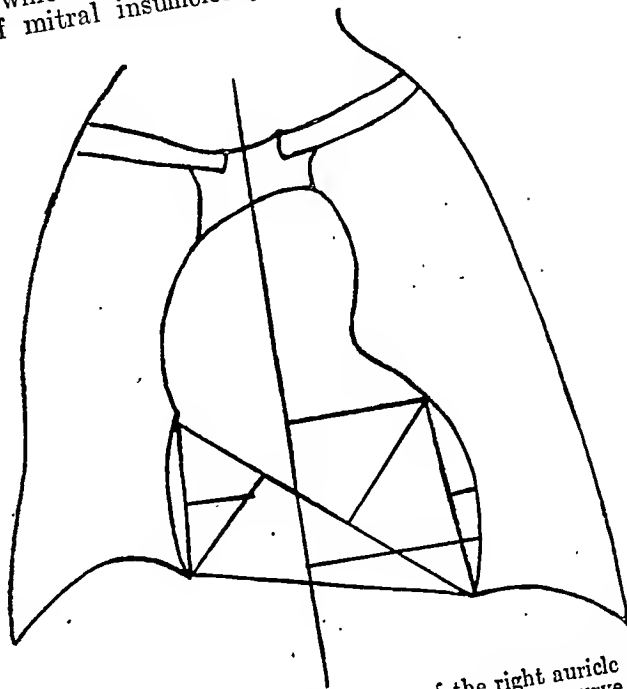


Fig. 8.—Hypertension. The junction of the right auricle and vascular arc is sharply accentuated and the curve of the ascending aorta is increased. The left ventricle is frequently enlarged.

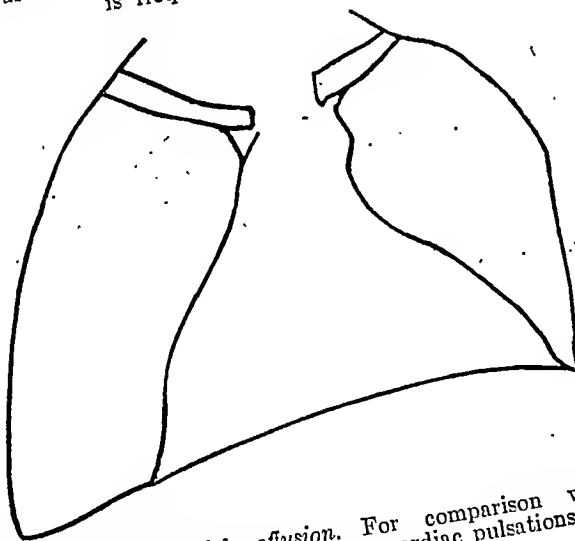


Fig. 9.—Pericardial effusion. For comparison with myxœdema. Roentgenoscopically cardiac pulsations are markedly diminished.

causing enlargement of the right heart, so that a progressive case shows general enlargement of the heart. For average measurements see table.

*Aortic stenosis.*—The characteristic change is enlargement of the left ventricle. The aorta is practically unchanged. The enlargement may be seen in the postero-anterior and left oblique views. The skiagram shows an increase in the

left median diameter, left ventricular measurement and bisector. The length of the heart is increased and the A. V. ratio low. For average measurements see table.

**Pulmonary stenosis.**—This condition may be associated with a defect in the inter-ventricular septum or with a patent ductus arteriosus.

The signs are exaggerated prominence of the shadow of the right side of the heart. The left ventricle is not enlarged but its apex is lifted away from the diaphragm, fluoroscopically marked systolic pulsation of the pulmonary artery and the roots of the lungs are observed. For average measurements see table.

**Aortitis.**—The width of the aortic shadow is increased and it bulges to the right. The aortic knuckle is flattened and broadened.

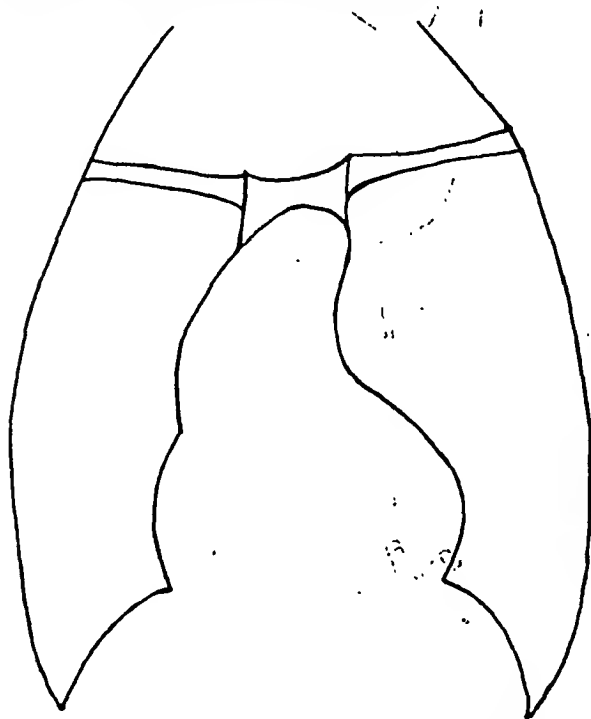


Fig. 10.—Tetralogy of Fallot. 'Coeur en Sabot'.

It is well to remember that increase in the diameter of the supracardiac shadows may be due to other causes than disease of the aorta, e.g., enlarged thymus, lymphosarcoma, and even a dilated oesophagus filled with food in cardio-spasm. Careful screening in different positions observing pulsation and the effects of a barium 'swallow' will prevent mistakes.

**Aneurysm of the aorta.**—The appearances due to aneurysm will vary with the size, site and shape of the pouching of the aortic wall. There may be general dilatation of the ascending or descending aorta, such as is usually seen in syphilitic aortitis. Sacculae may develop anywhere along the course of the vessel, but are most frequently seen at that portion of the arch from which springs the innominate artery. Screen examination will show expansive pulsation of the walls; which distinguishes aneurysm from other tumours of the mediastinum.

The general appearance of the heart will depend on the presence and degree of aortic regurgitation.

**Hypertension.**—Fluoroscopy in the postero-anterior position reveals enlargement of the left ventricle. The junction between the right auricle and the vascular arch is sharply defined and the curve of the vascular arch to the right accentuated. The shadow of the aorta is denser than normal and can frequently be seen in its whole length through the cardiac shadow. If the shadow of the aorta can be seen through that of the left ventricle the aorta is diseased.

In the left oblique position 'unfolding' of the aortic arch is frequently seen and is often one of the first signs.

Two-meter skiagrams confirm the above. The arch is seen to be elongated, projecting to the

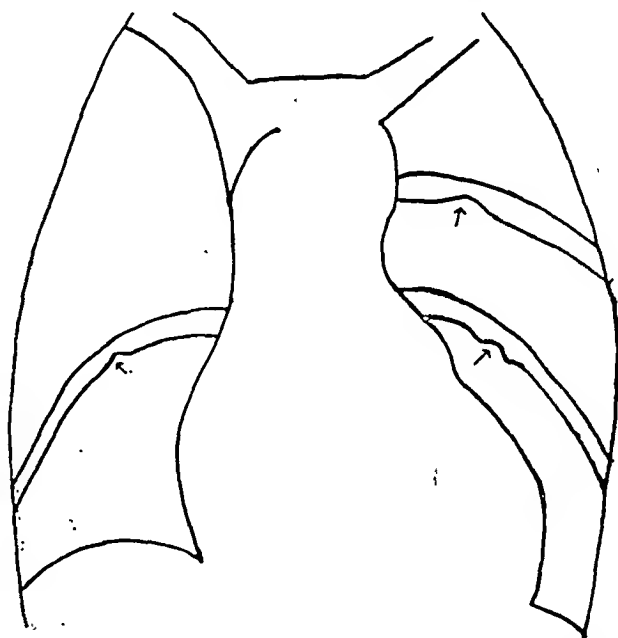


Fig. 11.—Coarctation of aorta. Note areas of focal erosion of ribs, enlarged left ventricle and small aortic knuckle.

right and rising higher than normal and sometimes reaching the first costal arch. The aortic knuckle may be unduly prominent.

- A distinction should be made between;
- (1) essential hypertension or hyperpiesia,
  - (2) hypertension with atheroma, and
  - (3) hypertension with renal changes.

In atheroma, the walls of the aorta being thickened, the shadow cast by this vessel is often denser than that of the left ventricle. Calcified plaques may be present around the rim of the knuckle, and in the descending aorta.

When renal changes are present, in addition to the characteristics of hypertension, gross hypertrophy and dilatation of both ventricles, more particularly the left, are found with evidence of valvular insufficiency. For average measurements see table.

**Thyrotoxicosis.**—The characteristic change is a straightening of the left border of the heart,

which becomes concave on deep inspiration. This is best observed near the auriculo-ventricular junction.

Fluoroscopy shows increase in amplitude and rate of the cardiac pulsation.

*Thyroid deficiency—myxœdema.*—The outstanding feature is the enlargement of the heart. There is a general increase in all measurements, suggesting pericardial effusion. In the latter case, however, the lower limits of the cardiac silhouette are obscured, and there are alterations in contour with changes in the position of the patient. Contractions are almost imperceptible. In myxœdema the contractions are unaltered in amplitude, rate and rhythm.

*Arrhythmias.*—Sinus arrhythmia and extrasystoles—no alteration in size or contour.

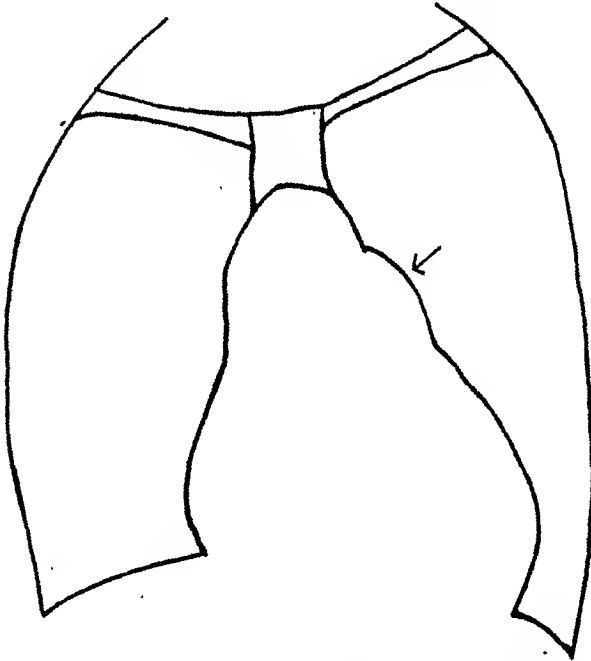


Fig. 12.—Patent ductus arteriosus. Note enlarged pulmonary artery.

*Auricular fibrillation.*—The amplitude of the contractions is diminished, especially in the auricles. The rhythm is irregular, and the rates vary.

Skiagrams show increased size of the auricles affecting the corresponding measurements.

*Heart block.*—There is a compensatory hypertrophy and dilatation of the left auricle causing increase in the left median diameter, left ventricular cavity and the bisector. The A. V. ratio is low.

*Myocardial impairment.*—In this all-important condition of the middle and old age, radiology can afford considerable help.

Fluoroscopically the amplitude of the contraction is much diminished. The left border of the heart is straight or concave. On turning the patient into left oblique position one may see a part of the contour of one of the ventricles, usually the left, which is immobile or moves in the opposite direction to the rest of the wall when the heart contracts or dilates.

This, if clearly evident, means infarction of the wall.

The skiagram shows the straight or concave left border and small bisector. The median diameters lie close to the diaphragm.

*Congenital lesions.*—It is not my object to discuss the cause of these lesions but a couple

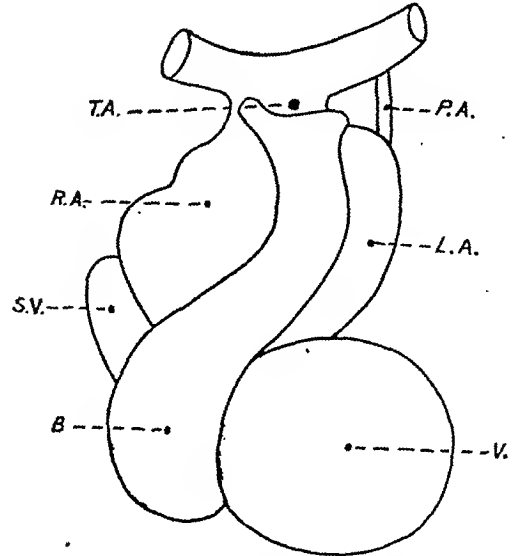


Fig. 13.—Diagram of fetal heart. (B) Bulbus cordis. (V) Common ventricle. (P.A.) Pulmonary artery. (T.A.) Truncus arteriosus. (R.A.) Right auricle. (L.A.) Left auricle. (S.V.) Sinus venosus.

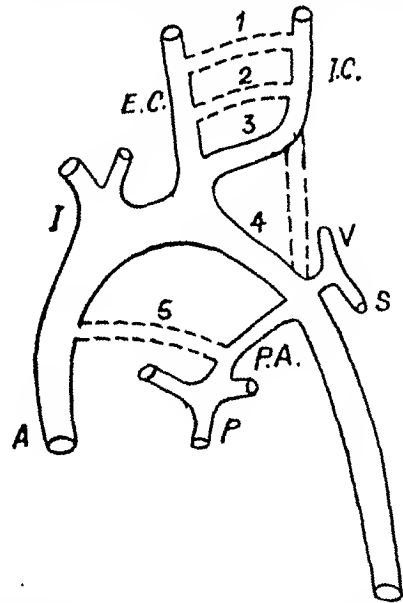


Fig. 14.—Development of left aortic arches: dotted lines indicate the vestigial arches. Numerals indicate the six arches.

of simple diagrams may help in their interpretation.

It is to be noted that in the course of development the ventricle is divided into two by the growth of the inter-ventricular septum starting from below. Similarly, the auricles are divided by the inter-auricular septum, though a communication, the foramen ovale, persists until birth.

The bulbus cordis finally disappears.

Some of the more important congenital abnormalities are due to incomplete disappearance of the bulbus cordis or incomplete development of the ventricular or auricular septa.

The segment of the aorta between the origin of the left subclavian and the ductus arteriosus is called the isthmus and has little blood passing through it in the foetus. It is consequently smaller in bore than the rest of the aorta.

*Skiagrams in congenital lesions.*—The changes observed concern the right side of the heart more than the left.

(1) The hypertrophied right ventricle lifts the apex away from the diaphragm (*coeur en sabot*).

(2) The conus of the right ventricle and pulmonary shadow may be absent (tetralogy of Fallot), or it may be accentuated (patent ductus arteriosus).

(3) The aorta may pass up on the right side of the spine (dextro-position).

(4) The aortic knuckle may be absent (coarctation of the aorta—right aortic arch).

*Patent interventricular septum.*—If the defect is large the right ventricle is hypertrophied causing a *coeur en sabot* skiagram.

#### *Tetralogy of Fallot*

This consists of:—

- (1) pulmonary stenosis,
- (2) defect in the inter-ventricular septum,
- (3) dextroposed aorta, and
- (4) hypertrophied right ventricle.

#### *Skiagrams show*

- (1) cardiac apex lifted away from the diaphragm,
- (2) concavity in the place of the shadow of the pulmonary artery, and
- (3) the ascending aorta passing up on the right of the spine and thus there may be a right-sided arch.

#### *Pulmonary stenosis with patent foramen ovale*

- (1) Right ventricle hypertrophied, and
- (2) shadow of conus prominent.

If the foramen ovale is closed the right ventricle is greatly hypertrophied, the right auricle

dilated and the shadow of the superior vena cava is prominent.

#### *Inter-auricular septal defects*

*Patent foramen ovale.*—The aortic knuckle is small or absent and the pulmonary shadow is enlarged.

*Defects at the lower portion of the septum.*—Anterior segment of mitral valve usually involved, therefore mitral incompetence or stenosis. *Coeur en sabot* may result. The hilum shadows are wide and dense and pulsate freely.

*Patent ductus arteriosus.*—The blood flows from the aorta to the pulmonary artery which is dilated or even aneurysm may develop.

The dilated pulmonary artery and enlarged right ventricle can be seen on screening.

*Coarctation of aorta.*—The dilated ascending aorta can be seen to the right of the spine. The aortic knuckle is small or absent.

In the left oblique position the aorta cannot be traced back to the spine, and its branches can be seen rising as a column from the heart shadow into the root of the neck.

Small erosions of the lower border of the posterior portions of the ribs, due to pressure by enlarged collateral vessels, are pathognomonic.

#### *Dextrocardia.*—Two forms are recognized.

(1) The heart is entirely reversed. The left ventricle forming the apex points to the right and there is general transposition of the viscera with the liver on the left and the stomach on the right. A barium meal in such cases emphasizes the changes, and it is important to note that the caecum and appendix lie on the left side. The heart is usually normal and the patient does not suffer.

(2) The heart is transposed, the venous ventricle forms the apex and lies on the right side. There is no transposition of the abdominal viscera. There are usually other abnormalities as well, such as patent ventricular septum.

[In writing this paper, the author acknowledges the help he obtained from *Recent Advances in Cardiology* by East and Bain, and from the October 1932 number of the *American Journal of Roentgenology*.]

*Average heart measurements in different conditions, in cubic centimetres*

	Normal range	Mitral stenosis	Mitral insufficiency	Double mitral lesions	Tricuspid insufficiency	Aortic insufficiency	Aortic stenosis	Pulmonary stenosis	Hypertension
Length ..	15.0 to 11.5	15.6	16.8	21.0	22.0	20.0	17.5	16.0	17.0
Transverse ..	14.5 to 9.5	15.4	16.0	21.0	23.0	19.6	16.8	15.5	15.5
Oblique ..	10.5 to 9.3	13.7	12.5	17.0	16.0	15.5	12.8	14.0	12.5
Left ventricle ..	8.5 to 6.7	7.0	9.2	9.5	12.1	13.2	10.8	8.5	10.0
Bisector ..	0.6 to 2.0	1.0	1.7	2.0	2.2	3.5	3.5	2.0	2.5
Right ventricle ..	14.7 to 8.5	14.5	15.3	18.9	21.7	19.0	16.0	16.0	15.5
Left auricle ..	5.0 to 3.5	7.5	7.0	8.2	8.9	7.0	7.8	6.0	6.5
Right auricle ..	6.5 to 3.5	8.0	7.7	11.5	9.4	8.0	8.0	8.0	7.5
A. V. ratio ..	0.534 to 0.704	1.000	0.600	0.800	0.527	0.500	0.500	0.704	0.650



## EXPERIENCE WITH RUSSELL'S VIPER VENOM

By J. B. HANCE, O.B.E., M.A., M.D. (Cantab.), F.R.C.S.E.  
LIEUTENANT-COLONEL, I.M.S.

Bangalore

*Case 1.*—The operation of tonsillectomy was performed on a male aged 48, Anglo-Indian, for the removal of grossly infected tonsils. This patient had warned the writer beforehand that he was, what he termed, a 'bleeder', and in consequence his coagulation time had been estimated and was found to be 6 minutes. In view of this increased figure, previous medication by calcium had been undertaken and prophylactic hæmoplastin had been administered.

In spite of these precautions the patient bled freely from the tonsillar site, the blood being notably fluid and with little tendency to clot. The hæmorrhage was of the general oozing type, there being no particular bleeding point. Since neither continued pressure nor suture of the pillars succeeded in stopping this bleeding, small pledgets of sterile cotton-wool were soaked in 1 in 10,000 solution of Russell's viper venom and these were swabbed over the tonsillar site. The effect was immediate and dramatic. The bleeding stopped forthwith, and the pillars of the fauces were sutured without trouble over a dry tonsillar bed. Beyond one vomit of blood which had obviously been swallowed, no further hæmorrhage took place.

*Case 2.*—Female, aged 36, Anglo-Indian. This patient had had 17 children and was reported to have bled after all her confinements. The last five of her confinements had taken place in the Lady Curzon Hospital, Bangalore, and on each occasion the patient had had postpartum hæmorrhage with or without retention of the placenta. After the 17th confinement, sterilization was recommended; but the husband of the patient was at that time unwilling. Subsequent to her discharge from hospital, she had, however, suffered from menorrhagia with severe floodings and passage of clots and for this complaint she again sought advice.

On examination, the uterus was found to be enlarged and the hæmorrhage was considered to be metropathic in origin; and hysterectomy was recommended.

On the 14th November, 1936, under spinal percaïn anæsthesia, a total hysterectomy was performed without any undue operative difficulty, and the patient returned to the ward in good condition. Five hours later, the writer was sent for by the house surgeon urgently on account of copious hæmorrhage. On arrival he found the patient collapsed with a pulse of 160 and barely perceptible, respirations were sighing, and the patient was blanched in a cold clammy sweat.

Immediate operation was performed, the wound opened up and a sub-peritoneal hæmatoma of the pelvic cellular tissue of the size of approximately a foetal head was evacuated. It was then found that the hæmorrhage was of the general oozing variety and that beyond two small para-vaginal veins there were no bleeding points; and the previous ligatures were verified. Ligature of the two para-vaginal veins did not materially lessen the hæmorrhage.

Accordingly, with the morning's experience of Russell's viper venom fresh in his mind, the writer decided to take the risk of an intravenous injection of a minute dose of Russell's viper venom. The patient's condition was desperate and there was no doubt that death would ensue rapidly unless the hæmorrhage could be controlled. The 1 in 10,000 solution of the morning was again diluted with sterile double-distilled water 1 in 10 making a final strength of 1 in 100,000. Of this solution 0.5 c.cm. was injected into the vein and the effect on the pelvic cellular oozing noted. Since in 10 minutes no marked effect had been produced the injection was repeated. It then became apparent that the cellular tissue was visibly drying and the oozing was visibly lessening. Thereupon a vaginal drain was inserted and the pelvic peritoneum united and the wound was closed in layers in the ordinary way.

Immediate direct arm-to-arm transfusion of 500 c.cm. of blood was carried out on the operation table; and the patient left the table with a pulse of 140, a better colour and generally in better condition than when she was brought to the theatre. There was no further evidence of hæmorrhage and the patient's condition progressively improved. During the 48 hours after operation the loss per vaginam was less than the normal menstrual loss of a healthy woman.

The preparation of Russell's viper venom used in these cases was 'Stypven' made by Messrs. Burroughs Wellcome and Co., a sample of which had, most fortunately, kindly been left by their representative, Mr. A. C. Johnston. It should here be stated that the preparation as issued by Messrs. Burroughs Wellcome most definitely states that it is 'not for injection'. But in conversation with Mr. Johnston the latter observed that he had heard rumours that successful results had been obtained elsewhere by the intravenous injection of a preparation of fresh Russell's viper venom in a dilution of 1 in 100,000. On subsequent enquiry, however, it turned out that this dilution is injected intradermally and not intravenously in the institution concerned. In view of the desperate condition of the patient, and the morning's experience, the writer decided that the risk was justifiable, and the results are here recorded.

*Case 3.*—Capt. T., aged 68, European, was admitted into the Bowring Civil Hospital on the 27th October, 1936, suffering from rigors, biliary colic and jaundice. He gave a history

of having bled freely all his life from slight injuries. Accordingly, his coagulation time was estimated on the 28th October and was found to be 9 minutes 20 seconds. His jaundice cleared up under medical treatment, but two subsequent severe attacks of biliary colic dictated operation. Accordingly, intensive calcium therapy was instituted and by the 15th November the coagulation time had been reduced to 6 minutes 30 seconds. Lower than 6 minutes it could not be brought with calcium and hæmoplastin.

The operation took place on the 20th November, the coagulation time that morning being 6 minutes. Half an hour before operation 0.5 c.cm. of 1 in 100,000 solution of Russell's viper venom was injected intradermally and the coagulation was estimated on the operating table before commencement. By then it had fallen to (complete coagulation) 4 minutes 30 seconds. The operation was commenced and the gall-bladder was found to be full of gall-stones, the cystic duct dilated and the common bile duct to be similarly filled with stones. The gall-bladder and 234 bile stones were removed, the common bile duct was drained, and the patient returned to bed.

During most of the operation, which was not without difficulty and took 75 minutes, there was no noticeable oozing in spite of the fact that several filmy adhesions, partially organized, had to be separated. In the final stages, however, when the abdomen was being closed, a certain amount of rather fluid oozing was noticed along the drainage tube left in Morrison's pouch. The coagulation time was accordingly estimated after the patient returned to bed, when it had risen to 5 minutes 45 seconds. A second 0.5 c.cm. intradermal injection of Russell's viper venom 1 in 100,000 was therefore given. Four hours later the coagulation was 5 minutes 30 seconds. In the evening, 8 hours after the second injection, the coagulation time had risen to 6 minutes; and, the next morning, 24 hours after the operation, the same value was obtained. After the second injection of Russell's viper venom all visible oozing along the tube completely stopped and did not recur.

#### Discussion

These three cases illustrate the use of Russell's viper venom as a styptic in three different ways. In the first case the preparation was used as the makers recommended after research on laboratory animals, and was a notable success. In the second case, the venom was used in a method which, so far as the writer is aware, has not been previously employed. The need was desperate and heroic measures were justifiable, and, in the event, justified.

In the light of the events here recorded it now seems probable that the assumption that both the postpartum hæmorrhage and the

menorrhagia were metropathic in origin is, at least partially, incorrect. The patient is an Anglo-Indian woman in poor circumstances, and her tendency to hæmorrhage of the oozing type is, in the writer's opinion, more probably attributable to persistent malnutrition, and also to an imbalance in her diet. In consequence, the blood calcium was probably low and the vitamins, notably 'A' and 'C', were almost certainly deficient. While the writer would hesitate to repeat the intravenous injection of the venom except in grave emergencies, or in the control of bleeding where he had reason to suppose that the blood coagulation time was abnormal, he would have no hesitation whatever in repeating it in similar circumstances.

In the third case, so far as the writer is aware, the intradermal method has not previously been used as a prophylactic, although the intradermal injection of Russell's viper venom in cases of typhoid fever with hæmorrhage has, the writer believes, been used as a curative measure with conspicuous success in Mysore. This case is, in the writer's opinion, the most satisfactory and convincing of the three, in that it was possible to check the effect of the administration of the venom by the estimation of the coagulation time of the blood. The case would, therefore, appear to indicate that the intradermal injection of the Russell's viper venom does, in fact, lessen the coagulation time in patients where the latter is naturally high.

The writer is aware of the danger of deductions from isolated cases; but he does consider that these cases, especially the second and the third, are sufficiently impressive to justify their being placed on record, in the hope that such apparently dramatic results may be confirmed by other observers. Should they be so confirmed, venom therapy would appear to open up a wide new vista in the treatment of hæmorrhage. Hæmoptysis, hæmatemesis, hæmorrhage from duodenal and typhoid ulcers and, notably, military surgery are merely some of the obvious fields of employment of this remedy.

The writer is indebted to the courtesy of Dr. T. Seshachalam of Mysore for the details of intradermal technique, as employed in the Krishnarajendra Hospital there, kindly supplied after the operation on the second case. He further wishes to record his acknowledgments to Messrs. Burroughs Wellcome and Co., and to their representative, Mr. A. C. Johnston, for the supply of the sample of their preparation 'Stypven'.

#### Summary

(1) Three cases are recorded in which Russell's viper venom was used in the control of bleeding, the preparation being used differently in each case:

- (a) by direct application,
- (b) by intravenous injection, and

(Continued at foot of next page)

## THE MORTALITY OF OPERATIONS FOR VESICAL CALCULUS IN INDIA

By E. W. HAYWARD, F.R.C.S.E.

*Principal Medical Officer, Jodhpur State*

THE following is an analysis of 359 consecutive operations done by various surgeons in the Windham Hospital, Jodhpur, during the years 1933-35. The only cases excluded are those few who had small stones removed under local anaesthesia with cystoscopic rongeur forceps and one who also had a stone in the kidney which was successfully removed at the same operation as litholapaxy was performed and which has been classified under stone in the kidney. At the end, the records of 78 cases done in the first eight months of 1936 are partially analysed with those of the last half of 1935.

### *Previously published figures*

Rowlands and Turner quote various mortality rates, the most recent being that of the Mayo Clinic which records 153 litholapaxies and 395 suprapubic lithotomies with death rates of 1.3 and 8.6 per cent, respectively. These figures presumably refer to well-fed Americans, whereas Sir Peter Fryer's figures consist chiefly of Indian ryots—a very different proposition. In my opinion Sir Peter's record of 986 litholapaxies and 116 suprapublics with death rates of 2.53 and 14.65 per cent is not likely to be improved upon to any great extent in India until the patients come for treatment before such health as is naturally theirs is weakened by months and years of pain and pyuria accompanied by the semi-starvation that is the lot of most who are no longer able during the monsoon weeks to till the field on whose produce they live from year to year. Better instruments and anaesthetics may help, but I am convinced that real improvement is impossible until the patients come so early that a stone of golf-ball size will fascinate those of us who to-day are scarcely interested in anything smaller than a cricket ball. Winsbury White quotes Anthony's wonderful results, but in the absence of details I am not prepared to comment on his 1,532 litholapaxies but only 56 lithotomies with death rates of 0.6 and 14.3 per cent, respectively.

### *The anaesthetic*

Gas and oxygen were not used on any of the cases under reference. It was not at first available and even now has to be used very sparingly as each empty gas cylinder has to travel over

*(Continued from previous page)*

(c) by intradermal injection.

(2) In view of the dramatic results obtained and the obvious wide field of employment for Russell's viper venom, if established, it is hoped that the cases here recorded will induce other observers to confirm the writer's results.

2,000 miles before it returns duly refilled. The normal anaesthetic used has been A. C. E. followed by ether given through a Shipway's apparatus. Spinal anaesthesia with either novocain, pantocain or Barker's stovaine has been used in some cases but often this was prevented by the patient having a very low blood pressure. Cases with chronic bronchitis were usually done under local novocain but, with this, wounds often tended to become septic and heal slowly, though this was due to the novocaine or to the patient's condition cannot be said. One or two litholapaxies were done with a local urethral anaesthetic, but this asks a good deal of the patient, however gentle one is.

### *Pre-operative treatment*

The routine in stone cases starts with a sounding in the out-patient department. This may appear to be an out-of-date method, but with a thousand outpatients a day and a limited staff it is the quickest and cheapest, as the repair of a damaged sound that the patient has hurled on the floor costs less than the repair of a cystoscope that has gone the same way. I must add, however, that doubtful cases are subjected to both cystoscopy and radiography. After a day or two in bed, during which time the ectoparasites that usually accompany the patients are caught, nails and hair are cut and bodies washed (often for the first time ever with soap as well as water), the patient is taken to the theatre. A cystoscopy is now always done except in the case of females and boys about ten years of age. Litholapaxy is regarded as the operation of choice and is always done when not contra-indicated. If contra-indicated suprapubic lithotomy is done.

### *Contra-indications to litholapaxy*

I regard the following as the main contra-indications:—

1. General weakness of the patient making a long operation inadvisable. This is largely a matter of the size of the stone although the capability of the surgeon to perform a speedy crushing also counts. This is by far the most important contra-indication to litholapaxy and is the one that chiefly accounts for the large number of suprapubic lithotomies done and their much higher mortality.

2. Too small a urethra to permit the passage of a lithotrite of the size needed to crush the particular stone present. Above five years the age of the patient is almost immaterial as a small lithotrite can always be passed; it is the size of the stone that matters.

3. Stones impacted in the neck of the bladder.

4. Stones which are very large or very hard—we have not met any that are too soft or too small or formed round foreign bodies.

5. The presence of a diverticulum of the bladder or a much enlarged prostate.

6. Advanced cystitis with a contracted bladder.

7. Urethritis, undilatable urethral stricture and a small fibrotic bladder must also be remembered as rare contra-indications.

I do not regard a small papilloma or other new growth as a contra-indication to litholapaxy as it should be possible to tilt the table and keep the stone away from it; later on it can be treated by diathermy, thus avoiding a cutting operation, which is both distasteful to the patient and risky as to implantation.

#### *Other operative methods*

I have no experience of perineal litholapaxy or lithotomy, or of vaginal lithotomy, except that I have had to transplant the ureters in a man who had had most of his bladder and perineum destroyed by an enthusiastic perineal litholapaxist elsewhere.

#### *Operative details*

It does not seem necessary to go into these, except to say that the clean and unbruised

either by flushing with a Bigelow evacuator or through an operating cystoscope. Similarly any loose piece of mucous membrane must be removed and not left to form the nucleus of a second stone. Cystoscopy a week after litholapaxy also gives one an excellent idea of what damage has been done to the bladder—it is very seldom (except in the case of really small stones) that one does not see one or two areas of submucous hæmorrhage, and, with an inexperienced operator, the appearance reminds one of a case of confluent smallpox. I am sure that this delay before doing the final cystoscopy is more than justified by the negligible recurrence rate that it ensures. We can only remember one case coming back in the last five or six years, but unfortunately we have no accurate records on this point nor are follow-up clinics possible.

#### *The mortality at different ages*

This is clearly shown in the following table and no comment is needed:—

Age	Lithotomies	Died	Percentage mortality	Litholapaxies	Died	Percentage mortality	Total operations	Died	Percentage mortality
1 to 7 years.	139	6	4.3	27	0	nil	166	6	3.6
8 to 15 years.	36	2	5.5	6	0	nil	42	2	4.7
16 to 40 years.	21	3	14.2	53	1	1.8	74	4	5.4
41 to 60 years.	29	12	41.3	44	2	4.5	73	14	19.1
61 and over.	2	2	100	2	0	nil	4	2	50
	227	25	11	132	3	2.2	359	28	7.7

bladder can usually be completely sutured after suprapubic lithotomy, a catheter being tied in per urethram and a rubber dam placed in the cave of Retzius. Septic bladders and those that have suffered much trauma during the withdrawal of the stone are best drained. Primary closing reduces the stay in hospital from an average of about 30 to 16 days. It must be remembered, however, that these long averages are largely due to the feeble old men who linger for weeks and will not heal up completely, but who cannot be discharged to their mud huts, perhaps fifty or more miles across the sandy desert from the nearest railway station, until they are fully healed and fit to face this journey, often on foot, at best on a camel or bullock cart.

Litholapaxy cases can be discharged after two or three days. I much prefer to keep them in for seven days at the end of which time they are cystoscoped. By this time all fragments of stone left behind at operation that are going to pass out per urethram have gone and if any piece is left, however small, it must be removed

*N.B.*—These figures correspond closely with those for the previous four years which were 207 lithotomies with 22 deaths, a rate of 11 per cent, and 204 litholapaxies with 5 deaths, a rate of 2.5 per cent.

#### *The causes of death*

1. Age group 1 to 7 years.
  - (a) Heat exhaustion and hyperpyrexia on the first day.
  - (b) Asthenia with pneumonia. He had been classed as a bad risk before operation and died on the 12th day.
  - (c) Entero-colitis 20th day, cause unknown.
  - (d) Cerebral malaria 11th day, despite being quite well until the 10th day and receiving quinine.
  - (e) Diarrhoea and fever 2nd day. Cause unknown.
  - (f) Vomiting and diarrhoea of unknown origin beginning on the 11th day, till when the child had been quite well, and ending fatally on the 14th day.

## 2. Age groups 8 to 15 years.

- (a) Asthenia with râles in the lungs (a very feeble patient).  
 (b) Another weak patient developed basal congestion, then pneumonia and died on the 11th day.

## 3. Age group 16 to 40 years.

- (a) Rupture of the bladder during litholapaxy accounts for one death.  
 (b) Asthenia claimed two patients who faded away one and two months respectively after operation.  
 (c) After spinal stovaine one man had a steadily falling blood pressure and respiratory embarrassment and died on the 3rd day.

## 4. Age group 41 to 60 years.

- (a) Asthenia claimed four suprapubic victims who just faded away on the 5th, 13th, 20th and 120th days after operation and one litholapaxy case on the 7th day.  
 (b) Post-operative pneumonia accounts for four who died on the 2nd, 3rd, 7th and 17th days.  
 (c) One died from toxæmia on the 9th day, the bladder having been grossly septic at the time of operation.  
 (d) One died from heart failure on the 9th day, autopsy revealing advanced myocardial degeneration.  
 (e) One case was lost on the 3rd day, due to rupture of the bladder during litholapaxy.  
 (f) One collapsed and died very rapidly for no apparent reason on the 5th day after the removal of a stone and a diverticulum.

was noticed. No really big stones were removed in this series; the largest only weighed 7 ounces 5 drachms when dry.

*The mortality at different seasons*

By the middle of 1935 we had realized that cases did much better in the cold weather than in the hot. Between June 1935 and August 1936, 136 cases were operated on, of which those done in 1935 are included in the three-year records given above, but those of 1936 are now analysed for the first time.

Of nine cases that died out of the 136 operated on, none died between 1st October and 30th April. The worst months here climatically are May to September when the thermometer may reach 123°F. in the shade and just before the rains break in July the humidity also is very high. There were no selection of cases, they came fairly regularly all the year round, with however some increase during the hot weather when they do not work in their fields. Fans are of course provided in the wards but they only stir up the hot air and do not really cool the patient down. The operating theatres are air-conditioned.

*The mortality at different concentrations of blood urea*

Similarly by the middle of 1935, a connection had been noticed between raised blood ureas and the operative prognosis. Of the 136 cases operated on since then, 59 did not have their blood urea taken as 52 of them were children under 16 years and seven of them had to be operated on soon after admission owing to a certain degree of retention of urine. The urine urea was not done in any case. The 77 cases whose blood ureas were examined resulted as follows:

Blood urea	Lithotomies	Died	Percentage mortality	Litholapaxies	Died	Percentage mortality	Total operations	Died	Percentage mortality
(a) 25 to 50	16	3	19	52	1	2	68	4	6
(b) 50 to 60	2	1	50	1	1	100	3	2	66
(c) Over 60	2	1	50	4	0	nil	6	1	17

- (g) Diarrhoea, possibly dysenteric, claimed one victim on the 14th day.

Of these all had a pre-operative note stating that their general health was poor or very poor except (e), (f) and (g).

## 5. Age group 61 and over.

- (a) One feeble old man of, he said, 95 survived for 11 days and then died of pneumonia, the anæsthetic having been local novocain.  
 (b) Another feeble one died of exhaustion on the 21st day.

*The mortality of different types of stones*

No relationship between the chemical composition or the sizes of stones and the death rate

From this, the mortality of those with blood ureas under 50 mgm. is seen to be 6 per cent while of those over 50 it is 33 per cent.

*The causes of death*

In the two young children out of the 59 cases whose blood urea was not done, the cause of death was heat stroke in one, coming on ten hours after the operation with a rapid rise of temperature and convulsions, and in the other diarrhoea and vomiting which began on the 11th day, ending fatally within 48 hours.

The causes in the cases whose blood ureas are recorded in the groups above were:—

Suprapubic lithotomies.

(a) 1. Collapsed on 5th day and died for no apparent reason [see 4. Age group 41-60, (f)].

2. Faded away 5th day after spinal anæsthetic and slight accumulation of fluid in cave of Retzius which did not drain well along the rubber dam.

3. Very septic bladder. Was given ACE, followed by open ether. Died apparently from chloroform poisoning on the 4th day.

(b) Very poor subject. Local novocain anæsthesia. Died on the 3rd night of myocardial failure.

(c) Poor subject, slightly insane. Local novocain anæsthesia. Recovered enough to go in a wheeled chair by 15th day, then faded away and died on the 29th day.

Litholapaxies.

(a) Rupture of bladder [see 3. Age group 16-40 (a)].

(b) Fell down dead while walking back from the latrine the day after operation. No post-mortem.

#### Summary

The prognosis of operations for vesical calculus appears to become progressively less favourable as the age of the patient increases. A blood urea of over 50 also reduces his chance of survival to 67 per cent as compared to 94 per cent if it is under 50 mgm. During one cold weather no deaths occurred but they started again as soon as the next hot weather arrived. Climatic conditions therefore appear to have some effect.

The 11 per cent mortality of suprapubic lithotomy is so much higher than the 2.2 per cent of litholapaxy because the latter is the operation of choice, while the former is done on those cases who are unfit for a long, general or a spinal anæsthetic or who have very large stones or septic bladders and are obviously bad risks from the very beginning. Little if anything can be done to reduce this mortality under the present conditions of life of the patients, whose poverty, physique and ignorance has to be seen to be believed. The risk of litholapaxy is very slight (1 in 132) apart from the surgical error of rupturing the bladder (2 in 132), a tragedy which has occurred less frequently as the various operators have become more experienced, although attempting to crush a relatively big stone in a small bladder may lead to this tragedy even in the best hands.

In conclusion, a stone case who is physically fit and young would appear in a good climate to have an excellent prognosis, but the feeble old man with a high blood urea in the middle of the hot weather is a very grave surgical risk.

The prognosis of these cases seems to depend really on the ability of the system to withstand the shock even of a rapid (6-12 minutes)

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## DEEDS OF VIOLENCE IN INDIA IN 1935-36 AND OTHER CRIMES IN WHICH SEROLOGY PLAYS A PART

By S. D. S. GREVAL, B.Sc. (Punjab), M.D., Ch.B.,  
D.P.H. (Liverpool)

MAJOR, I.M.S.

Imperial Serologist and Chemical Examiner to the  
Government of India, Calcutta School of Tropical  
Medicine

It occurred to me that a little amplification of one of the tabular statements prepared for the annual report on the working of this department would make the figures given therein useful to the ethnologist, the economist and the statistician. This has been done. Purports have been added to the enactments.

The department is connected with the deeds of violence thus: Chemical examiners in the provinces receive all the suspected materials, they forward to the department all exhibits on which they find blood; but as often as not they also forward exhibits on which they have not found blood, with the remarks 'Blood not confirmed'. The department undertakes to determine the origin of the blood, human or animal. Material other than blood is also received and its origin determined serologically, e.g., semen, flesh, bone, etc.

The table gives only the enactments under which enquiries were being made against an alleged wrong-doer at the time the suspected material was collected. This fact would account for the frequent interchange of the allied sections of the Indian Penal Code. Multiple enactments or enquiries under sections dealing with comparatively trivial failings of human conduct are legal manoeuvres.

The table does not give (1) the exact total of all crimes of violence, (2) convictions or even (3) cases found positive for the evidence sought for. It is on the whole, however, a good indicator of crimes committed in the country.

#### (Continued from previous column)

suprapubic lithotomy under local novocain. The straw that breaks the camel's back may be the heat of the ward, the general weakness of the patient or a certain degree of renal inefficiency, but nearer than that I have been unable to get in considering the causes of death after operations for vesical calculus.

Those who have worked among the ryots of India will not enquire why the more unfavourable cases are not postponed till they are fit and the weather cool. To those who have not worked here, I would say come and see the physique and mentality of these people before being too critical of our operative mortality.

Finally I must record my gratitude to my colleagues, Dr. B. L. Mehta and Dr. J. S. Mathur, for their great help in the preparation of this note.



*A table showing the number of cases of crime in India, by provinces, under various enactments, tested by the Imperial Serologist and Chemical Examiner to the Government of India, Calcutta, in 1935-36.*

	CENTRALLY ADMINISTERED AREAS					Total
	Coorg	Ajmer-Merwara	Deccan	Political Agencies	Delhi	Baluchistan
	1	4	2	5	10	5
	..	..	..	..	..	..
	..	2	..	1 1	.. 4	..
	..	..	..	..	..	..
Indian States	94	3	3 5	4 1	..	..
Assam	44	2	7 4	..	..	..
N. W. F. Province	84	6	4 28	3 1	..	..
Central Provinces	82	10	1 3	.. 2	..	..
Burma	147	52	11 1	4 15	6	..
[Bombay and Sind	389	13	26 45	8 5	.. 2	4
Sind	104	1	7 16	3 1	..	3
Bombay	285	12	19 29	5 4	.. 2	1
Bihar and Orissa	155	12	43 21	6 1	2	1
Bengal	143	14	51 15	8 8	3 3	10
United Provinces	296	8	58 22	53 2	4 6	17
Punjab	494	31	37 59	70 8	1 7	23
Madras	769	39	17 19	49 23	11 6	.. 4
302 Punishment for murder	..	..	..	..	..	..
326 Voluntarily causing grievous hurt by dangerous or sharp weapons.	..	..	..	..	..	..
376 Punishment for rape	..	..	..	..	..	..
304 Punishment for culpable homicide not amounting to murder.	..	..	..	..	..	..
307 Attempt to murder	..	..	..	..	..	..
324 Hurt by dangerous or sharp weapons.	..	..	..	..	..	..
397 Robbery with attempt to cause death or grievous hurt.	..	..	..	..	..	..
394 Voluntarily causing hurt in committing robbery.	..	..	..	..	..	..
377 Unnatural offences	..	..	..	..	..	..
147 Punishment for rioting	..	..	..	..	..	..
148 Rioting armed with deadly weapons.	..	..	..	..	..	..
295 Defiling place of worship	..	..	..	..	..	..
304A Causing death by negligence	..	..	..	..	..	..
305 Abetment of suicide of child and insane person.	..	..	..	..	..	..
306 Abetment of suicide	1	..	..	..	..	..
308 Attempt to commit culpable homicide.	..	..	..	..	..	..
309 Attempt to commit suicide	..	..	..	..	..	..
312 Causing miscarriage	2	..	..	..	..	..
313 Causing miscarriage without consent.	..	..	..	..	..	..
317 Abandonment of child	..	..	..	..	..	..
318 Concealment of birth by secret disposal of dead body.	..	..	..	..	..	..
320 Grievous hurt	..	..	..	..	..	..
321 Voluntarily causing hurt	..	..	..	..	..	..
323 Punishment for voluntarily causing hurt.	..	..	..	..	..	..
325 Punishment for causing grievous hurt.	1	..	..	..	..	..
333 Causing grievous hurt to public servant on duty.	1	..	..	..	..	..



TABLE—concl'd.

Total	2	3	34	48	3	2	1	1	3	2	13	4	1	3	1	1	1	1	3	6	2	2	5	11
CENTRALLY ADMINISTERED AREAS	Coorg	::	::	::	:	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::
	Ajmer-Merwara	::	::	::	:	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::
	Deccan	::	::	::	:	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::
	Political Agencies	::	::	::	:	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::
	Delhi	::	::	::	:	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::
	Baluchistan	::	::	::	:	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::
Indian States	::	::	::	:		::		::		::														
Assam	::	::	1	:	:	::		::		::														
N. W. F. Province	::	::	1	7	1				3	2			1									1	1	1
Central Provinces	::	::	::	:		::		::		::														
Burma	::	::	::	:	:	::		::		::							1						1	9
[Bombay and Sind	::	::	1	:		::		::		::														
Sind	::	::	1	:		::		::		::														
Bombay	::	::	::	:		::		::		::														
Bihar and Orissa	2	7	15	1						4	1									1	1	1	2	
Bengal	1	7	7							1	2											1	1	1
United Provinces		11	5			1				1	1			1						1	4			
Punjab	2	7	13	1		1	1			2	5				2	1				1	1			
Madras																								
	377, etc. Unnatural offences, etc. 143, etc. Punishment for unlawful assembly, etc. 147, etc. Punishment for rioting, etc. 148, etc. Rioting armed with deadly weapons, etc. 149, etc. Members of unlawful assembly guilty of offence committed in prosecution of common object, etc. 201, etc. Screening offence, etc. 308, etc. Attempt to commit culpable homicide, etc. 317, etc. Abandonment of child, etc. 318, etc. Concealment of birth by secret disposal of dead body, etc. 320, etc. Grievous hurt, etc. 324, etc. Hurt by dangerous or sharp weapons, etc. 325, etc. Punishment for causing grievous hurt, etc. 327, etc. Voluntarily causing hurt to extort property or to constrain to an illegal act, etc. 333, etc. Causing grievous hurt to public servant on duty, etc. 341, etc. Punishment for wrongful restraint, etc. 342, etc. Punishment for wrongful confinement, etc. 354, etc. Criminal force to outrage a woman's modesty, etc. 363, etc. Punishment for kidnapping, etc. 366, etc. Kidnapping to compel a woman into marriage, etc. 379, etc. Punishment for theft, etc. 380, etc. Theft in dwelling house, etc. 392, etc. Punishment for robbery, etc. 395, etc. Punishment for dacoity, etc.																							



and makes possible at a glance a comparison between the various provinces.

The following extract from a case, apart from the intrinsic interest it has as an account of a human sacrifice, will show how a negative serological finding may be compatible with conviction :—

*Sessions case No. 49 of 1936*

*Salem Division, Madras*

Prisoner—Chinna Chetti *alias* Munippan.

Offence—Section 302, I. P. C.—murder.

'On the night of the 31st December, 1935, he intentionally killed his son, Hanumadu.

The deceased, a suckling babe at the time of his death, was the youngest of his three children by his wife (P. W. 7), who lived with him at Bennangur about 25 yards from the Karaga Mariamman Temple. About three weeks before the occurrence, he proposed to her the sacrifice of one of their children to the Mariamman goddess, as an effective method of getting access to hidden treasure buried in a forest and becoming wealthy; but she did not take him seriously. After taking his supper with toddy and fowl curry at about 10 p.m. on the day of occurrence, he left the house saying that he had to go to the village, and, returning about a quarter of an hour later, went to bed. Some time after this, as she was just getting sleep, she saw him stand for a while near the bamboo cradle where the deceased slept, and abruptly go out of the house closing the door behind him. When she woke up shortly afterwards to suckle the child, she found it missing from the cradle. Thereupon she came out, and, seeing light at that untimely hour in the temple, ran there, when to her great horror she saw her husband place the severed head of the child in a mud bowl, used as a lid for a mud pot, containing two karagams (sacred pots) secured in a pit which served as an altar in front of the idol. He next covered the bowl with a granite slab. P. W. 7. set up a yell at this ghastly sight, but the accused encouragingly asked her not to cry saying that the goddess will perform a miracle and restore the child; and pushing her away carried the trunk of the infant towards the burial ground about a furlong away.....

..... In the lower court, P. W. 7 posing as an eye-witness deposed that she found her husband put his foot on the child's chest and sever its head from the trunk with M. O. 1, their bill-hook. But neither here nor before the village headman did she claim to have actually witnessed the deed. It is not unlikely that when P. W. 15 noticing some stains on her sari (certified by the chemical examiner not to be of blood) questioned her about them, she developed the story of having been an eye-witness to the commission of the crime by her husband and produced M. O. 1 in proof of her assertion. The Imperial Serologist could discover only the blood of a bird (probably a fowl) on this weapon..... These circumstances seem to suggest that P. W. 7 was at first probably a consenting party to the child's sacrifice and possibly believed that such an act of apparent religious merit might even redeem its life. So grotesquely superstitious and credulous are some of the village folk..... One fact emerges from her inconsistent statements, namely, that she cannot be trusted in all that she says..... The accused's plea of alibi stands unproved, and I find not the slightest reason for disbelieving the neighbours who saw him that night in his house and were told by him that P. W. 7 was weeping for nothing.....

The assessors' unanimous opinion that the accused is not guilty is based solely on the untrustworthiness of P. W. 7's testimony..... Disagreeing therefore from the assessors, I find him guilty as charged. Only one sentence is possible..... till he is dead'.

The bill-hook, evidently, figured in the fowl curry and not in the decapitation of the infant.

## A CASE OF HÆMOGLOBINURIA CAUSED BY PLASMOCHIN TAKEN AS A PRO-PHYLACTIC AGAINST MALARIA

By MIN SEIN, M.B. (Cal.), M.R.C.P. (Lond.)

CAPTAIN, I.M.S.

*Civil Surgeon, Toungoo, Burma*

As far as I could make out from limited references no case has been recorded in which plasmochin, taken as a prophylactic against malaria, has resulted in hæmoglobinuria. The interest in the following case lies in the fact that hæmoglobinuria could be definitely attributable to the taking of plasmochin.

The patient, an Indian sepoy (J. S.), aged 20 years, was one of the party of men from the 1/17th Dogra Regiment engaged on a flag march in the jungle in Tharrawaddy district in Lower Burma, between the 31st October and 5th November, 1932. Each man was being given 0.04 gramme plasmochin daily as a prophylactic against malaria. After the end of the fourth day's march (*i.e.*, on 3rd November), he reported sick and was transferred to Mingaladon by train. His complaints then were being feverish, general abdominal discomfort and pain without nausea or vomiting. He was admitted into the British Military Hospital (I. W.), Mingaladon, on 5th November for the following complaints:—

Pain in the left upper quadrant of the abdomen, and fever. The pain was mild and temperature was 99.5°F. in the morning and 100°F. in the evening. There was no previous history of malaria. Physical examination was negative. There was no superficial nor deep tenderness. Spleen was not enlarged. No malarial parasites were found in the blood smear. Next morning he was reported to have had a 'fainting fit'. The sub-assistant surgeon who saw him first found him in a state of shock with cold extremities, covered with sweat. The pulse was weak and thready. He recovered soon after and was treated for collapse. I saw him a little while later when he complained of pain in the left loin. The patient explained that he had an acute attack of abdominal pain limited to the left side which was so severe that it doubled him up and that he had lost consciousness.

The patient was found to be markedly jaundiced and in a state of collapse with cold and cyanosed extremities. Temperature was normal; pulse was soft but regular and of normal rate. Hæmic murmur was heard in the pulmonary area. Pain was complained of just below the last rib on the left side on bimanual pressure and on deep inspiration. The kidneys were not palpable. There was slight œdema of the feet.

The patient could not pass urine when asked to do so. Close questioning elicited the fact that the patient had passed dark-coloured urine since the 3rd November, but had not reported this as he has taken no notice of this fact. Treatment was instituted with warmth, and massive doses of alkaline diuretics. At about noon the patient passed about 10 ounces of urine which was port wine in colour. The urine contained bile, blood pigment and albumin. Microscopic examination revealed few red blood cells, and epithelial cells. Glucose and sodium bicarbonate, barley water and soda water were given *ad lib*. There were no malarial parasites in the blood smear.

### Subsequent progress:—

There was fever for a few days. Jaundice became very marked and generalized on the next day and the patient complained of giddiness. General condition was fair. Malarial parasites were not found in the blood smears taken on several occasions. The red blood cell count was 3½ millions, and the leucocyte count 7,500 per c.mm. Hæmoglobin was 45 per cent. Urine was still port wine in colour and contained bile, blood pigment, albumin, and a few red blood cells. The total

quantity passed during 24 hours was 60 ounces. Differential count showed polymorphonuclears 67 per cent, lymphocytes 25 per cent, large mononuclears 7 per cent and eosinophiles 1 per cent. Large doses of ferri et ammonii citras were given with a little arsenic.

The condition gradually improved day by day and by the 15th November the jaundice had cleared up, but anemia was still marked. The pain and tenderness in the loin disappeared in a few days. The patient was discharged cured on the 30th November when red blood cells were  $4\frac{1}{2}$  millions and leucocytes were 7,600 per c.mm. and hæmoglobin 85 per cent.

The following examinations were also done:—Blood and urine culture—negative. Van den Bergh's test—direct reaction was negative and indirect reaction was positive. The patient was examined regularly afterwards but recovery was complete and maintained.

### Comment

In spite of widespread interest maintained, the cause of hæmoglobinuria (blackwater fever) has never been satisfactorily determined. Cases have been published where the onset of hæmoglobinuria had occurred under the following conditions:—

(1) Independently in a recognized malarial subject.

(2) During an attack of malarial fever—

(a) when quinine had not been given,

(b) when the patient had been treated with quinine alone or in combination with other drugs, and

(c) when atabrin and plasmochin had been given.

Several authorities are agreed that quinine may start an attack of hæmoglobinuria (blackwater fever). Similarly, cases have been published in which treatment of malaria with plasmochin, with or without atabrin, had resulted in hæmoglobinuria. But there seems to have been no record of hæmoglobinuria occurring as a result of taking plasmochin as a prophylactic, though it has been used extensively for this purpose. During the Burma Rebellion (1930–32) plasmochin was used extensively, side by side with quinine, as a prophylactic against malaria. In the Pegu area where I was in medical charge of the troops, about 300 men received a daily dose of 0.02 gramme plasmochin during November and December 1931. The minimum period of administration was three weeks and the maximum seven weeks. A careful watch was kept for any untoward symptoms but in all there were not more than half a dozen cases in which the symptoms complained of were mild epigastric pain or colic, easily controlled by stopping the administration of the drug and giving gastric sedatives. This is in conformity with the experience of others who have used the drug for a similar purpose. But the case described demonstrated that such a small dose as the total amount given in four days, i.e., 0.16 gramme, could, in susceptible subjects, result in hæmoglobinuria. In this case, either due to defective excretion, to idiosyncrasy, or to both, the drug caused a massive and

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## THE DENUDED PENIS AFTER OPERATION FOR ELEPHANTOID SCROTUM

By M. M. CRUICKSHANK

LIEUTENANT-COLONEL, I.M.S.

General Hospital, Madras

THE treatment of the penis entirely denuded of skin after operative treatment for elephantoid conditions of the penis and scrotum has never proved satisfactory. Several lines of treatment have been advised.

The application of a Thiersch graft, the usual procedure, results in a penis which is simply tucked down to the pubic region by a tight collar of fibrous tissue, the stretched penis, upon which the grafts have been laid, collapsing inside the bandage, the moment tension ceases, the grafts merely tucking up round its base.

Connell (1932) states that Thiersch's method appears to be unsuitable and that he personally has never used it. His method of dealing with the raw penis is by threading it through a subcutaneous tunnel on the inner aspect of the thigh and liberating it some ten days later by means of a simple flap incision.

This flap, which must be broad when dissected up, gives the penis an abnormally bulky covering of skin and subcutaneous tissue. The result however is not always a happy one, because, unless broad, the flap may become gangrenous, may not fit round the penis without a certain amount of tension, and, as a result, a considerable amount of scar tissue forms on

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sudden hæmolysis with the resulting hæmoglobinuria. From this it may be deduced that in blackwater fever also the toxins of the malarial parasites by themselves or with the help of drugs such as quinine, atabrin or plasmochin might cause massive hæmolysis, hæmoglobinæmia and hæmoglobinuria in susceptible individuals.

I have to thank the Officer Commanding the British Military Hospital (I. W.), Mingaladon, for permission to publish the above case which was under my charge whilst I was a medical officer attached to that hospital.

[Note.—The writer has used synonymously hæmoglobinuria, a symptom, and blackwater fever, a clinical syndrome; this is not in our opinion justifiable.

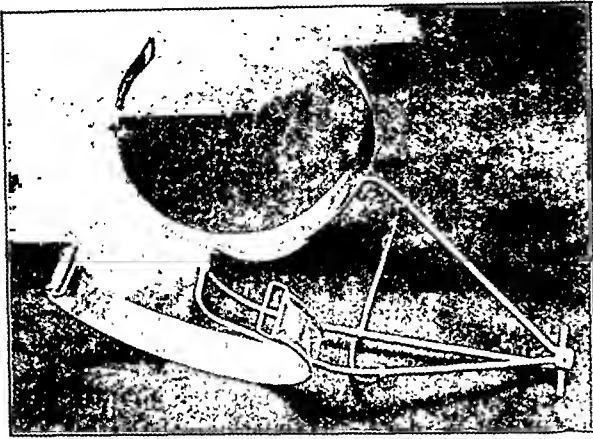
He refers to the frequent use of plasmochin as a prophylactic in malaria. We are doubtful if it was ever used very extensively as a personal prophylactic, as early in 1931 a crucial experiment was performed in which it was shown that a total dose of 0.42 gramme of plasmochin given over a period of a week did not give protection against malarial infection. Such a dose may be expected to cause symptoms in quite a large percentage of the people taking it.

The value of plasmochin lies in its anti-gametocyte powers. A total dose of 0.06 gramme is usually sufficient to clear the blood of gametocytes; in this capacity it is valuable as a general prophylactic measure.—EDITOR, I. M. G.]

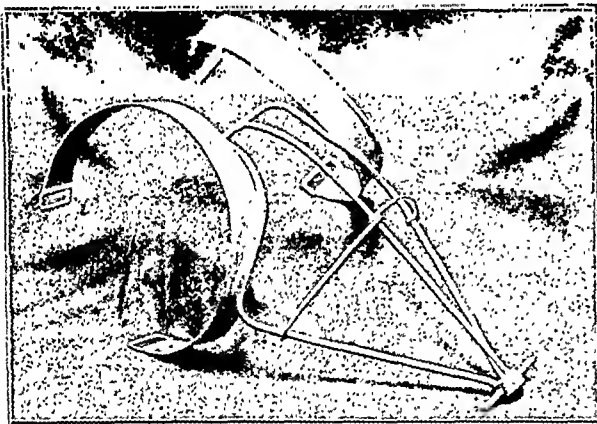


the penis which tends to vitiate results which at the best cannot be termed æsthetic.

In an endeavour to avoid death of parts of the flap, I have dissected up and clothed the penis, short sections at a time. The ultimate



result is no better, because the organ, due to the vagaries of fibrosis, is misshapen and requires several plastic operations to render it more or less straight and central.



Again, I have tried making use of a pedicle graft from the thigh with which to clothe the penis. The results are about the same as those obtained by the 'tunnel' operation.

Such disheartening results might, I thought, be obviated could the penis but be kept extended for a time sufficient to allow pedicle flaps or Thiersch grafts to 'take'.

With this object in view I had made a splint on the lines of a Cabot splint, with bands encircling the thighs, by means of which it could be fixed in one position, these bands lying in the groin along Poupert's ligament, so that even if the patient pulled his knees up in bed yet the apex of the splint remained approximately in the same position. The penis is extended by means of a silk suture passed deeply through the region of the frænum and

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## RHEUMATIC FEVER IN THE PUNJAB

By B. L. KAMRA, M.B., B.S.

Medical Officer in charge, Rattewala (Sohangarh) Dispensary, Tehsil Muktsar, District Ferozepore

EVIDENCE in support of the existence of rheumatic fever in the Punjab has been presented by Hughes and Yusuf and Wig. The purpose of this article is to support the view of the above workers, and to attempt to gauge the frequency of the disease in this rural area of the Punjab.

Out of the new patients under 30 years of age, attending the outdoor department of this dispensary during the period extending from 12th August, 1935, to 19th November, 1935, as

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was tied to the small cross bar at the apex of the splint.

So positioned, movements of the thighs are not transmitted to the splint in any degree sufficient to pull out the extending suture. Long Thiersch grafts are now cut from the thigh—one or two will suffice—and applied like a roller bandage to the penis from the corona to the base, care being taken to see that at the base the graft is made to lie snugly under the thick pubic skin.

At points along its course the graft is tucked down at its edge by fine catgut sutures. This prevents any movement on the part of the graft, which is simply covered with a piece of gauze soaked in sterile liquid paraffin applied as a small roller bandage. I have tried applying the grafts vertically along the penis but better results have followed in those cases where the graft or grafts have been applied as one would a roller bandage. The post-operative result, both from cosmetic and utilitarian view-points, is far superior to that obtained by the methods mentioned above where no splint is used. That some shrinkage of these grafts will take place cannot be denied, but, judging from results a month after operation, I feel sure that the final result will be very satisfactory.

It now remains to be seen, whether or not, using this splint, better results will follow the use of a Thiersch graft or a full thickness pedicle graft.

The splint has been made for me by Messrs. Hebbar Brothers Ltd., 246, Thambu Chetty Street, Madras.

To Dr. Hebbar I am much indebted for the help he has afforded me in making various models of the splint.

### REFERENCE

Connell, W. K. (1932). Operative Treatment of Elephantoid Scrotum. *Brit. Journ. Surg.*, Vol. XIX, p. 651.

many as could conveniently be done were daily examined for valvular lesions and an attempt was made to elicit choreic movements, if present, by asking them to spread out their hands with palms downwards. On meeting with positive signs, careful enquiry regarding past history of rheumatic infection was recorded. Twenty patients were examined daily and the total number thus examined was 1,000. The findings are tabulated below :—

The total population of these villages is 5,625 and the number of persons seen by the writer during the last 12 months that are known to have suffered from rheumatic fever with or without consequent endocarditis were 12, that is, 2.13 per thousand of the total population.

During the period extending from 1st January, 1933, to 30th September, 1935, 247 cases were treated in the indoor department of this dispensary for different diseases. Out of these, four

TABLE

*Abstract of the examination of 1,000 cases (outdoor) for rheumatic infection*

Age groups	Number of cases free from rheumatic infection	CASES OF ARTICULAR RHEUMATISM		CASES OF RHEUMATIC ENDOCARDITIS		Total
		Male	Female	Male	Female	
1 to 5 years ..	448	..	..	..	..	448
6 to 10 " ..	159	..	..	..	1	160
11 to 15 " ..	109	..	..	1	1	111
16 to 20 " ..	120	1	..	1	1	123
21 to 25 " ..	84	..	1	..	1	86
26 to 30 " ..	72	..	..	..	..	72
TOTAL ..	992	1	1	2	4	1,000

In the course of this search for valvular lesions, which on account of the rush of work in the 'outdoor' could only be done by auscultation, both systolic and diastolic murmurs in the mitral area and systolic murmurs in the pulmonary were met with. The latter was always disregarded and not accepted as evidence of rheumatic infection; they were found to be hæmic murmurs in all cases. The mitral systolic bruit was found in cases of prolonged pyrexia and anæmia; it was due to the atony of the myocardium and the consequent dilatation of the mitral ring. It always disappeared soon after the removal of the cause. Mitral systolic murmur, therefore, was not taken as evidence of rheumatic infection, unless there was a definite history of acute or sub-acute articular rheumatism or chorea.

The sound in the mitral area normally varied so much in character in different cases as to make its alteration or prolongation unreliable in indicating rheumatic endocarditis.

In all the cases tabulated above as cases of present or past rheumatic infection there was no question of syphilis or atheroma. I was satisfied that all were clinically true cases of rheumatic infection.

This dispensary is situated in a village, named Rattewala (Sohangarh), tehsil Muktsar, district Ferozepore. It receives patients for its 'outdoor' from the villages around, covering an area of about 48 square miles.

cases were of acute rheumatic fever and three of mitral stenosis with past history of subacute or acute articular rheumatism. Notes on these four cases are given below :—

(1) S., a Mohammedan male, 14 years of age, was admitted on 31st July, 1935, with severe pain in joints and high fever (102.1°F.). The illness started seven days ago with discomfort and slight pain in the small joints of both feet. Two days later the pain became worse and the patient was laid up with high fever. The knee, ankle, and wrist joints became involved successively. The pain was shifting in character; ankle, knee, and tarsal joints were swollen; the left knee had fluid in it. They were so painful that even the slightest movement was impossible. Pulse was regular and 112 per minute with normal tension and full volume. Apex beat was in the fifth intercostal space in the mammary line. The cardiac dullness had increased transversely. Soft systolic bruit was present in the mitral area.

He was put on sodium salicylate, gr. 20, four times a day (80 grains per diem), to which he responded wonderfully. On admission, he could not even turn over and within 24 hours he could not sit up in bed. On 6th August the dose of the salicylate was decreased to 30 grains a day, when trouble relapsed in the right ankle and readily subsided on increasing the dose to 100 grains a day.

He was discharged at the request of his father on domestic grounds with instructions to continue taking medicine. Systolic bruit was present then in the mitral area on 13th August.

On 4th November, 1935, he was again examined and found suffering from an attack of chorea. Systolic bruit in the mitral area was present.

(2) M. S., 32 years of age, carpenter by profession, was admitted on 1st May, 1935, for pain in the joints. About a month ago his illness started with acute pain.

The joints to be first involved were the shoulders and back joints. Next the fingers and elbow joints were affected. The pain was shifting in character. The joints first involved cleared up and a fresh set was next affected. In this way the patient mentioned all the joints which at one time or other got involved. On admission the knees, wrists and ankle joints were swollen and painful. The patient was confined to bed. His temperature was 99.4°F.

There was roughening of the first sound at the mitral area, otherwise heart was apparently normal.

He was put upon sodium salicylate, a drachm a day. Pains disappeared within one week and he was discharged cured on 16th May. Since July 1935, he has been working as a carpenter, engaged in building a new ward for this dispensary.

His heart was examined again on 6th November, 1935, and found normal on palpation, percussion and auscultation. The roughening of first sound, previously present, could not be detected.

(3) S., a Mohammedan male, 14 years of age, attended the outdoor department of this dispensary on 6th August, 1935, complaining of cough and breathlessness on exertion. On examining his heart, the apex beat was palpated in the fifth intercostal space in the mammary line; cardiac dullness was found increased in size transversely, and auscultation revealed a long diastolic bruit in the mitral area. The bruit terminated in the first sound; the second sound was not heard in the mitral area.

The liver was enlarged downwards; its lower edge could be felt two-finger breadths below the right costal margin.

There was no history of acute articular trouble, which might have confined him to bed, though on enquiry his father stated that pain in the legs and back had been complained of by the patient off and on for the last two years and a half.

(4) H. C., a Hindu male, 17 years of age, was admitted to this dispensary on 7th September, 1935, for swelling of the feet, legs and ascites. He gave a definite history of subacute articular pain two and a half years ago, when he got swelling and pain of the foot, knees and later other joints. Pulse count was 116 per minute, regular, volume and tension normal and equal on both sides. Cardiac dullness was increased laterally and downwards. A faint diastolic bruit was present in the mitral area; it was better heard when examined in the standing posture. He was put on tincture digitalis and intramuscular injections of salyrgan. Paracentesis abdominis had to be performed for the relief of ascites.

During the eight years of my practice in this part of the country I have treated only three cases of chorea. Two were girls, one of whom is now 11 years old. She got the attack in January 1934. Her heart was normal then. I examined her again on 3rd October, 1935, and heard a systolic murmur in the mitral area; compensation was good and the girl was healthy otherwise.

I have not come across rheumatic subcutaneous nodules so far.

I am satisfied that rheumatic fever does exist in this country area of the Punjab. McSweeney has estimated that the proportion of children showing rheumatic heart disease in Cardiff is 5.82 per 1,000 of the school population. It was found to be 7.72 per 1,000 in Bristol, as compared with 1.28 for Bath and 1.03 for Gloucestershire. It was also reported that juvenile rheumatism is a disease of towns, as opposed to country areas, and of industrial towns in particular. Perusal of the table will show that

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## SIGNIFICANCE OF FLORENCE TEST FOR SEMINAL STAINS\*

By RAI BAHADUR K. N. BAGCHI, B.Sc., M.B., D.T.M., F.L.C.  
Chemical Examiner to the Government of Bengal,  
Calcutta

THE choline periodide, or Florence test, for seminal stains has been proved to be of immense value in medico-legal work and adopted as a routine test in all medico-legal laboratories.

In this laboratory the seminal stains are always examined for the micro-crystals of choline periodide as well as the spermatozoa and the result is expressed in terms of spermatozoa, *viz*, positive or negative according as the spermatozoa are found or not found. Too much reliance is not placed on the Florence test on account of the fact that in certain cases with a negative Florence test spermatozoa have been detected. The reason for this anomalous finding is in some cases the washing of the garments and consequent dilution of the choline-containing substance of the semen, while a few spermatozoa which happened to penetrate into the

\* Being a paper read (in modified form) at the medical section of the Indian Science Congress held at Hyderabad on the 2nd to 8th January, 1937.

(Continued from previous column)

it is not less common in this rural area of the Punjab than in the towns of England.

Efforts should be made to banish the idea that rheumatic fever does not exist in the Punjab. In children the onset and course of the disease may often be subacute, and thus may be frequently overlooked, if the possibility of its existence be not kept in mind. The early recognition of this destructive disease is of paramount importance in influencing its treatment. I, therefore, take this opportunity to appeal to the authorities of the Punjab Medical Department that steps be taken to circulate instructions amongst its medical officers in charge of hospitals and dispensaries to inform them of the existence of rheumatic fever in the Punjab, to put them on the alert to diagnose typical and subacute cases, and to treat them thoroughly. The replenishment of the supply of sodium salicylate should be considered as important as that of quinine or other specifics. I am sure this will result in enormous good.

### Summary

A thousand outdoor cases, attending for different ailments, were examined for the existence of rheumatic endocarditis; the results are given in the table.

Four cases are reported in detail.

I am greatly indebted to Lieut.-Col. K. R. Batra for useful advice and kind permission to publish this article.

meshes of the fabric and got entangled there were not washed out. The washing in these cases is always with cold water and without any soap as is usually done by people in the countryside during their daily bath. It may also be due to some unknown chemical changes brought about by foreign matter containing all sorts of bacteria. Whatever be the reason, the fact is there and as a result of these findings a negative Florence test alone is not considered as a confirmatory test, and a spermatozoon is always searched for in all negative cases. In cases with a positive Florence test, on the other hand, the spermatozoa have in some cases not been found in spite of painstaking searches for the same and it was therefore believed that the positive Florence reaction in the particular cases had nothing to do with semen, but was probably due to the presence of blood or pus or some other choline-containing materials which are responsible for positive reaction. But in the light of the following observations it will be seen that the significance of this test has not been properly understood and there is considerable scope for modification of the interpretation of the result.

Lately, I had an occasion to examine an absolutely fresh specimen of semen of an aspermia case in which not a single spermatozoon, live or dead, could be detected, but the choline-periodide crystals developed readily and large beautiful crystals, as obtained in normal seminal fluid, were seen under the microscope. The colour, smell and consistency and also the cellular elements of the specimen were quite normal and the man was strong and otherwise healthy. It is therefore evident that the Florence test does not depend in any way on the spermatozoa but on choline of the spermatic fluid, which contains the highest amount of choline (Fletcher *et al*, 1935). The prostatic secretion obtained by carefully massaging the prostate and avoiding the seminal vesicles as far as possible also gives a slightly positive Florence test. The choline-containing substance is therefore contained in the secretion of the testes and possibly of the prostate and the production of the crystals clearly indicates the presence of the spermatic fluid quite independently of spermatozoa.

It may however be contended that choline from other sources may cause a positive reaction but the garments which are received for medico-legal examinations exclude all possibilities of presence of any choline-containing material other than semen. Blood contains a negligible amount of choline and its presence along with semen in mixed stains does not help in producing the periodide crystals, but on the other hand interferes with the reaction and the crystals do not form in the usual course. In such cases a positive reaction is obtained with difficulty after a preliminary treatment for removal of the blood proteins (Newcomb, 1932). The faecal

stains have been found to give no positive reaction. The gonorrhœal and leucorrhœal discharges resemble the seminal stains closely and are found very often in the garments. Fresh specimens of these discharges obtained from the gynæcological and venereal hospitals were examined carefully and found to give no positive Florence reaction. Neither purulent nasal discharge nor sputum, usually found in clothes, gives any positive reaction. Under these circumstances a positive reaction may be safely taken as an indication of the presence of seminal stains only.

Cases of aspermia are of course rare, but in my experience they are not so rare as it is generally believed, and these people are quite potent sexually and are likely to be involved in sexual offences. A prolonged search for spermatozoa is therefore useless in an aspermia case, and, if the presence of spermatozoa is taken as a criterion for giving opinion as to the presence of semen as it was our practice hitherto, the opinion is obviously fallacious. The formation of choline-periodide crystals, on the other hand, indicates nothing but the presence of spermatic fluid and may therefore be taken as a true index of the seminal stains. But in view of the fact that spermatozoa are sometimes found in cases with a negative Florence reaction, a careful and prolonged search for a spermatozoon is absolutely necessary before a negative opinion is given.

Greatest care should be taken in performing the test. The concentration of the aqueous extract of the stains from the garments is an important factor and it should be borne in mind that too much dilution is always to be avoided, in spite of the fact that a solution of pure choline is stated to give the micro-crystals of choline periodide in a dilution of even 1 : 50,000. The difference in the concentration of pure solutions of choline has been found to produce a pleomorphism of the periodide crystals; as, for instance, with much diluted solution 'thin black rods', instead of the usual monoclinic forms, are obtained, while with a strong solution a precipitate of blood and dark-brown globules looking like oil-globules are formed (Booth, 1935). It has also been found that the esters of choline from the tissues do not give a positive Florence reaction, but, if an ester is hydrolysed for about two minutes with a dilute alkali (1 per cent solution of NaOH) at room temperature and then acidified with dilute hydrochloric acid, the reaction is readily brought about in suitable dilution (Booth, 1935 *loc. cit.*). The presence of an alkali also retards the reaction but the difficulty is got over by acidification with dilute hydrochloric acid. The clothes which are generally received in cases of sexual offences bear the seminal stains mixed with all imaginable sorts of filthy matter, including faeces, urine, pus, blood, gum and starch (added fraudulently to produce the

characteristic stiffness), *pan* juice (containing lime and catechu), and mud; choline is likely to be chemically changed by some unknown factors present in some of the above extraneous materials and a positive reaction may not be obtained even in well-defined cases. The possibility of a chemical change of choline should therefore be thought of and the extracts of the stains from such dirty garments should, if a preliminary test becomes negative, be hydrolysed as a routine measure with a few drops of one per cent NaOH and then acidified with dilute HCl and submitted to the test once again. This procedure has proved useful in our hands.

Considering the ease and rapidity with which a stain is examined by this method, it is of immense value when a large number of articles are to be examined daily. A careful search for spermatozoa under the microscope is very trying and it takes an unusually long time to detect a spermatozoon in badly-preserved garments, specially during the wet months of the year when the stains remain moist for a considerable time; the garments are packed up without drying them properly and, as a result, bacterial decomposition sets in and the spermatozoa are disintegrated beyond recognition. Choline is left unaltered in these conditions and gives a satisfactory positive Florence reaction showing its value as a chemical method of detecting spermatic fluid. As time is an important consideration in laboratories where a large number of articles are examined the

chemical test for detection of semen is really a great help to the analyst.

In conclusion, I would like to thank Dr. S. K. Ganguli, M.B., D.T.M., for rendering valuable assistance in the course of this investigation.

### Summary

Spermatic fluid always gives a positive Florence test, which does not depend upon the presence of spermatozoa, and is obtained equally well in cases of aspermia. Gonorrhœal pus of men, leucorrhœal discharge of women, nasal discharge, sputum, faeces, etc., which are likely to be found in the garments, do not give a positive reaction. Therefore, a positive Florence test is good enough for an opinion that the stains are of semen and search for spermatozoa is useless. A negative Florence test, on the other hand, does not always indicate absence of semen, and in such cases a thorough search for a spermatozoon is necessary. Hydrolysis of the watery extract of the stains with dilute alkali and subsequent acidification with hydrochloric acid helps in some cases to produce a positive reaction by liberating the free choline. Choline periodide is pleomorphic—depending upon the concentration of the extract.

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## A Mirror of Hospital Practice

### CARCINOID TUMOUR OF THE APPENDIX

By M. M. CRUICKSHANK

LIEUTENANT-COLONEL, I.M.S.

General Hospital, Madras

THE comparative rarity of carcinoid tumours of the appendix justify the report of a case presenting certain atypical features.

A girl, aged 19 years, was admitted into the hospital on 20th March, 1936, complaining of pain of ten days' duration in the right iliac fossa. The pain had commenced in the lower abdomen, had settled in the right iliac fossa, was accompanied by a feeling of nausea, but there was no vomiting. Pulse and temperature were normal and, apart from a certain discomfort on deep palpation in the right iliac area, nothing abnormal could be made out on examination.

The patient expressed herself as perfectly well and three days later left the hospital, refusing operative treatment for what was definitely a mild attack of appendicitis.

On 14th May, 1936, she was readmitted suffering from a similar attack, which had commenced the previous day with intermittent pain in the right iliac fossa, this time accompanied with nausea and vomiting. Pulse and temperature were normal and again, apart from local tenderness on deep palpation, nothing very definite was elicited.

On 15th May appendectomy was done under general anaesthesia, through a right paramedian incision.

The appendix was retrocaecal, possessed a very limited and narrow meso-appendix, was short and thick (about 2½ to 3 inches long and ½ an inch in diameter) and firm with a uniformly smooth greyish-white surface, not unlike a small sausage stuck on to the caecal wall. The appendix was so firm right up to the caecum that the clamp had to be placed tangentially across the caecum rather than on the stump of the appendix, otherwise the appendectomy presented no unusual difficulty.

On cutting into the specimen it was noted that it felt hard, though not gritty, to the touch. The lumen was practically non-existent and signs of acute inflammation were not evident. The cut surface showed definite patches of yellowish colour. The specimen was sent to the pathologist, Dr. Vasudevan, to whom I am indebted for the following report:—

'The submucous tissue is markedly thickened and fibrosed and shows numerous newly-formed blood vessels with marked perivascular infiltration. There are also collections of plasma cells and eosinophiles. This cellular infiltration is also seen in the muscular and serous layers.

In another section, in addition to the changes described above, in the serous layer are seen collections of spheroidal cells arranged in groups, in places showing alveolar arrangement. A few of the cell groups are infiltrating the muscular layers but are absent in the submucous and mucous layers, and the appearance is not unlike that of scirrhus such as is seen in the breast.



No mitotic figures are to be seen.

A section stained by silver impregnation shows the presence of argentaffine cells.

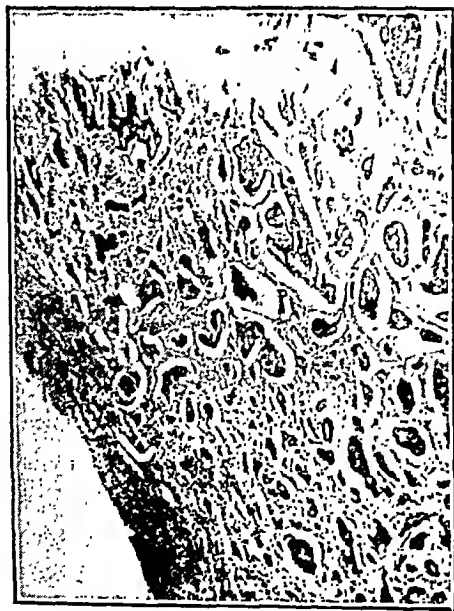
### Discussion

This specimen is peculiar in (1) that the carcinoid appearance and solid alveolar arrange-



High power.

ment of spheroidal cells are absent from the mucous and submucous layers, but present in the serous layer, and (2) that the lesion is not



Low power.

confined to part of the appendix but is distributed throughout its length.

The characteristic features of a carcinoid tumour are :—

(1) The yellowish colour of the cut surface on naked-eye examination. On cross-section a

yellow ring encircles the appendix and appears to lie in the submucous coat. The yellow colour is due to a lipoid material similar to that found in the cells of the adrenal cortex and in xanthoma cells.

(2) The microscopic picture suggestive of carcinoma, *viz*, spheroidal cells arranged in solid alveolar masses usually in the mucosa and submucosa, but sometimes penetrating to the muscularis and even as far as the subserosa. The cytoplasm of the cells may be granular or may be vacuolated. That these contained granules may stain intensely with silver has raised much speculation as to the histogenesis of this type of tumour, because, while demonstrating this fact, Masson has also shown that the Kulchitzky cells in the glands of Lieberkühn in the intestine stain in a similar manner. Masson's view is that the carcinoids of the appendix and intestine arise from these Kulchitzky cells, which belong to the chromaffin system, and because of their silver-reducing property are known as argentaffine cells. These cells arise from the epithelium lining the glands of Lieberkühn and migrate as a result of some stimulus, perhaps an inflammatory process, into the nerves and become argentaffine. The age incidence of carcinoid of the appendix is early, and though invariably benign in the appendix, it is probable that all carcinoids are potentially malignant.

## HÆMATOKOLPOS AND HÆMATOMETRA

By R. L. SONI, M.B., B.S., F.R.H.S.

The Soni Clinic, Paungde, Burma

M. K., a Burmese girl aged 15, had some 'colicky' pains in the lower part of her abdomen towards the evening of the 3rd September, 1935, and to relieve her she was given a purgative. Next morning she purged and while straining down noticed some blood-tinged mucus coming from her rectum. The pains continued and became worse and were associated every now and then with the expression of some blood and mucus. She was given home remedies for dysentery but she made no progress and when I saw her she had suffered continuous pain for two days and three nights.

The girl was crying out with pain, sitting on the floor with her body bent forwards and her hands clenched into her abdomen. At intervals she would sit quietly for some minutes but the pain recurred. She complained of severe persistent backache, gripping pain in the abdomen and at intervals a sudden severe pain below her umbilicus and in the rectal region. She had had two somewhat similar though mild attacks, each lasting for some three days—the first two months earlier and the last three weeks ago. She had not yet commenced menstruation and there was no history of urinary retention though of late she had noticed unusual frequency.

*Examination.*—Nothing abnormal was detected in the abdomen except in the hypogastrium where there was a hard, rounded, somewhat tender, intra-abdominal



swelling rising from below and extending some four-finger breadths above the symphysis pubis, like an enlarged uterus. The labia minora in their lower halves were fused together to form a bulging pouch which contained foul-smelling soft matter at the top and phosphatic concretions at the bottom. The pouch was cleared of its contents, irrigated with iodine lotion and cut open in the middle line between two artery forceps. No vaginal opening was evident nor did any appreciable bulge mark its site, but the place was tense and excoriated. Rectal examination revealed congested veins and a tense, large, globular swelling which occluded it from the anterior. The finger could easily be passed behind it but anteriorly it was obstructed some two inches from the anal orifice. No waves of contraction could be elicited on recto-abdominal palpation. The finger returned stained with blood and mucus.

**Operation.**—After emptying the bladder and cleaning the parts with acriflavine, under local infiltration anaesthesia the site corresponding to the vaginal opening was incised and the dissection carried up in the median line. A prominent bulge made its appearance at a depth of about an inch. Under spinal anaesthesia the bulging mass was separated all round to some depth, and this dissection was considerably helped by a finger in the rectum and a catheter in the bladder. As the dissection proceeded the mass itself protruded more and more till it almost reached the skin surface. It was desired to reinforce the recto-vaginal space, which had thinned down, but this could not be done for lack of working space, which was at this stage wholly occupied by the bulging sac. The sac was loosely stitched to the sides and punctured, and tarry odourless fluid flowed out in a stream. The flow was regulated by an artery forceps in the puncture, to avoid the danger of collapse from sudden decompression. About two pints escaped in about 1½ hours when she sweated profusely, complained of giddiness and her pulse was found to be thready. Half a c.cm. of pituitrin relieved her. The forceps were now withdrawn and the fluid allowed to ooze out unchecked.

A loose diaper was kept on and she was advised to change it frequently. Also an ergot-quinine mixture was prescribed.

Subsequent course:—

The tarry fluid continued to come out for about 20 hours and then there was a reddish flow lasting for another two days.

On the fourth day the uterus was not palpable abdominally. The vaginal wound was inflamed, the stitches had given way, and the temperature was 100°F. The lower part of the vagina was packed with gauze soaked in B. I. P. P. and the pack changed every morning for a week. Examined later the wound was found to have healed and the vagina appeared normal except for a copious white discharge. The cervix was normal and the uterus firm and in its proper place. The tubal regions were also found normal on bi-manual palpation and the bulge into the rectum was absent.

The next menses occurred after 27 days and lasted for two days. It was scanty and associated with backache. She was given freshly-prepared calcium lactate in mixture and liquor asoka and advised to take plenty of fresh vegetables, milk and fruits. The three menses that followed were somewhat irregular but for the last six periods she has been quite regular and normal.

**Comment.**—Cases where hæmatometra is superimposed on hæmatokolpos are comparatively rare and may be taken to be due to failure of early recognition of the condition. In this case it appears that the lower part of the Mullerian duct had failed in canalization though the remaining parts of the genital tract above it appear to have developed normally. The pouch formed by the lower parts of the labia minora is of interest, but it cannot be

definitely stated whether it was a congenital malformation or the result of an acquired adhesion, though the appearances were suggestive of the former. The phosphatic concretions were most probably derived from the ammoniacal decomposition of urine.

## STONE IN THE URETHRA OF A BABY

By RAMENDRA K. BASU

*Civil Assistant Surgeon, Kishanganj, District Purnea*

A BOY, aged ten months, was brought to me with the history that he had not passed urine for several days.

The child was in obvious distress and the bladder greatly distended and tender. The penis was erect and on palpation a hard mass could be felt near the anterior end of the urethra. Urethral obstruction was confirmed by failure to pass a fine rubber catheter further than the obstructing mass.

The child was lightly anaesthetized and the obstructing body worked forward to the meatus by external manipulation. The meatus was incised sufficiently to expose the point of the obstruction which was then removed by leverage with the single blade of a Spencer-Wells artery forceps.

The urine was drawn off with a fine rubber catheter and the meatus sutured with fine silk. The urine was turbid and was found to be heavily charged with oxalate crystals.

Next day the prepuce was very oedematous causing obstruction to the passage of urine, so the child was circumcised after which he made a complete recovery.

The foreign body proved to be a calculus the size of a black pepper, of dark brown colour, and nearly round.

I am reporting this case as it must be very rare for so young a child to develop a stone.

## CALCIUM OXALATE CALCULUS IN THE URETHRA

By S. N. MITRA, I.M.F.

*Medical Officer, Namdang Tea Estate Hospital, P. O. Margherita (Upper Assam)*

A MALE, aged about 40 years, employed as a 'line' chowkidar, was admitted into the hospital on the 7th September, 1936, with the following symptoms:—

Frequency of micturition for one year, the quantity passed on each occasion being very small and pain and irritability of the glans penis. These symptoms had become much worse during the past four or five days. There was a slight muco-purulent discharge from the meatus and microscopical examination revealed intracellular diplococci.

A soft rubber catheter was passed and was arrested just three-quarters of an inch behind the glans penis by a hard mass which could be felt on external palpation. It was extracted by artery forceps after breaking it into four pieces and it was identified as a calcium oxalate calculus. The total size of the stone was three-quarters by half an inch, irregular, very hard, and dark brown in colour. The patient was relieved of his symptoms and no further stone could be detected either in the bladder or in the urethra.

The man has lived in the garden for over 20 years. There is no previous history of any continuous fever nor any family history of calculus. He is much addicted to drinking country liquor and chews a great deal of betelnut.

# Indian Medical Gazette

FEBRUARY

## COD-LIVER OIL IN SURGERY

ABOUT three years ago Professor W. Löhr reported, at a Medical Congress at Magdeburgh, the remarkable results he had achieved during the previous two or three years by the use of cod-liver oil in the treatment of septic lacerated wounds, compound fractures, acute osteomyelitis and burns; in short in any conditions where pyogenic infection plays an important part. He first tried cod-liver oil dressings because he had formed the impression that wounds healed better in children who were taking cod-liver oil internally than in those who were not having it, and his results were so promising that he soon adopted this method of dressing as a routine treatment for practically all septic conditions. In addition to oil dressings he employed the usual surgical procedures, such as free evacuation of pus and excision of dirty wounds, before filling the cavity with cod-liver oil and covered the area by a plaster splint to ensure immobilization of the part if such were necessary. Unless there were indications for its removal, this dressing was left in place for about a fortnight without renewal.

This work of Löhr's was altogether empirical and all the explanation offered for the good effect of cod-liver oil as opposed to other oils was that it contained an unspecified 'something' which other oils lacked. Such remarkable results naturally attracted a good deal of attention and it was not long before other reports began to appear confirming Löhr's claims, and in England Steel of Liverpool gave an account of his experience in the use of this oil in treating burns and showed that the healing under dressings of cod-liver oil was much better than under tannic or picric acids, the remedies that have been considered the best for several years in the relief of these painful injuries.

So far no attempt had been made to identify specifically the active principle responsible for the healing powers of cod-liver oil, but it was a foregone conclusion that this form of treatment would not be allowed long to remain on this rule of thumb basis and that research workers would soon attempt to solve this problem, and so provide a sound scientific explanation for the facts which had been amply established by clinical observation.

Papers on this aspect of the subject have now begun to appear and among them are two in the *Lancet* of September last year. It is natural in times, such as the present, when vitamins loom so large before us that the well-known high vitamin-A content of cod-liver oil should

be considered as the first possibility to be investigated. The first of the papers quoted above is by Davson at Manchester University, and as a preliminary he performed experiments to show that cod-liver oil was definitely a more active stimulant to tissue response than other oils. He injected into rabbits' ears cod-liver oil, olive oil and paraffin and it was clearly demonstrated that the tissue reaction surrounding the cod-liver oil globules was much more active and led to the production of more completely organized new tissue than in either of the controls. With the idea of finding out whether vitamin A was the responsible agent, a second series of experiments was performed using cod-liver oil and halibut-liver oil, because the latter has a much greater vitamin-A content than the former. Both these oils were used undiluted and diluted 1 in 20 in olive oil, and pure olive oil was used as a control. It was found that halibut-liver oil, with approximately one hundred times as great a vitamin-A content as cod-liver oil, was no more active than the latter either in the pure or in the diluted state. It is concluded by this worker that vitamin A is not the important factor and two other possibilities are suggested. One is that animal oils are more rapidly and completely hydrolyzed in animal tissues than are vegetable or mineral oils, and the other is that vitamin D, which is present in approximately equal proportions in cod-liver and halibut-liver oils, may be the active principle.

The second paper to which we have referred is by Sandor in Hungary and altogether disagrees with the above conclusions, for it is claimed that pure vitamin A without any vitamin D, and mixed in an inert base such as paraffin in the form of an ointment, is just as effective as cod-liver oil, so that Sandor and the group of workers associated with him ascribe the therapeutic value of cod-liver oil to vitamin A alone.

As is to be expected cod-liver oil or its manufactured substitute, known as vulnovitan, is being tried on all kinds of conditions. There are several reports of its value in clearing up eye infections of many kinds and in promoting the healing of indolent corneal ulcers. It is claimed that cutaneous ulcers with large granulating surfaces and no tendency to heal, under cod-liver oil after an intense cellular reaction lose these granulations and are replaced by healthy healing tissue.

The group of workers associated with Sandor report on the successful treatment of cases of surgical tuberculosis and even of gastric and duodenal ulcer. These numerous uses of cod-liver oil indicate that as a new and apparently valuable remedy for external application it most probably will be tried and possibly claimed as a cure for all the ills to which flesh is heir. We have had some small experience of this form of treatment, both in pyogenic skin diseases and

anal fissure, and have been favourably impressed with it.

It will of course not fulfil all the expectations of the uncritical enthusiast, but there is little doubt that when its powers have been properly

assessed it will be found a valuable substitute for more irritating antiseptics and will prove an important addition to our collection of external medicaments for a certain number of diseases.

## Special Article

### FAIRS AND FESTIVALS IN INDIA\*

By R. B. LAL, M.B., B.S., D.P.H., D.T.M. & H., D.B.

*Officiating Director, All-India Institute of Hygiene and Public Health, Calcutta*

MAN, says Aristotle, is a social animal. We gather together for purposes of social intercourse, for celebrating fairs and festivals, for transacting business, and unfortunately also for waging wars. In doing so not only do we exchange our sentiments and feelings, our wares and our bullets, but also, unless we are particularly careful, we unwittingly exchange our respiratory and intestinal flora, and ectoparasites. Exposure to infection in this manner starts early in life, but as we grow older our contacts in the daily round increase and the spheres of the sources of infection enlarge and we contract many a common malady. The common cold is an example. However, under settled conditions of life, partly on account of natural adjustment of the herd resistance and partly to conscious communal efforts, the evil effects of this exchange of flora are, in a civilized community, very much minimized. In large gatherings, on the other hand, all safety measures are liable to break down with dire consequences. It is under these circumstances that the technical knowledge, the administrative capacity and the resourcefulness of the public health official are taxed to their fullest extent. To escape from disastrous epidemics, therefore, we must look up to the health administrator for his thorough understanding of the problem, foresight, attention to minutest details, qualities of leadership and physical capacity on the one hand, and on the other to the confidence reposed in him by the community in the form of co-operation, investment of legal powers and provision of material resources.

The slow but steady development of international rules of health and the administrative machinery set up to enforce them have, to a great extent, banished the dangers arising out of the communicable diseases in relation to trade and travel though the increasing speed of modern transport is every day creating new

problems. Again, the recent advance in military hygiene has removed the horrors of war so far as the epidemic diseases are concerned.

The problem of the management of the fairs is much more difficult to solve. The public health official possesses neither the dictatorial powers of the military hygienist, nor the material resources of the Port Health Officer. The pilgrim centres in this country draw their religious devotees in millions from all parts of the country; each individual contributes his own quota of infection peculiar to himself. His religious fervour is great, but his material resources are scanty. He is half starved and possesses but little means of protection against the inclemency of the weather. His ignorance on the one hand and the avarice of the priests and other opportunists on the other conspire to dispose him of what little he does possess. He is not used to any discipline and is in no mood to co-operate with the authorities. Besides, he finds himself in strange circumstances where he is unable and unwilling to abide by the few rules of health which he was in the habit of performing. Thus in a fair we have congregations of an undisciplined mass of humanity capable of generating a large quantum of various kinds of infection. They possess little or no resistance due to lack of previous experience of the infection or due to malnutrition, nervousness and hardship. They are huddled together under ideal conditions for the spread of the infection. It is little wonder, therefore, that fairs and pilgrim centres have acquired a notoriety in the history of epidemic diseases in this country and are justly dreaded by health authorities as starting points of widespread epidemics. Not only is the place of congregation the danger spot, but the nodal points along the pilgrim routes are sources of equal anxiety to the health administrators. These camping grounds or temporary abodes, where confluence of the stream of pilgrims arriving from different routes takes place, are also hot-beds of epidemic diseases. They are much more difficult to manage than the fair grounds themselves.

Epidemics of cholera have time and again been traced from the pilgrim centres, such as Hardwar, Allahabad and Puri, but many other epidemic diseases, less dramatic in their manifestations and more difficult to trace, must also arise in connection with the fairs. Records are

\*Being a lecture delivered at the Public Health Society, Calcutta, on the 18th December, 1936.

We hope to publish a similar lecture on some public health subject each month during the year.—EDITOR, I. M. G.

full of such happenings. It is, however, not my intention to dilate on this point, but the history of cholera in the Punjab in relation to the Kumbh and the Adha-Kumbh fairs at Hardwar is a clear demonstration of the rôle of the festivals in the causation of this epidemic disease. Similarly, at Allahabad, each and every gathering at the time of the Kumbh and Adha-Kumbh from 1882 to 1918 was accompanied by a great rise of cholera incidence in the eastern districts of the United Provinces, Bihar and Orissa, and the Central Provinces. The Ratha Jatra fair at Puri, Sinhasht fair at Nasik and Godavari, Puskaram fair at Rajamundry, Krishna Puskaram at Bezwada, Mahamakshan fair at Kumbhakonam and Sagor Mela in the Sundarbans occupy no less enviable position in relation to cholera epidemics. Some of the epidemics in connection with these fairs have led to world-wide epidemics. It must, however, be remembered that it is not only these mammoth gatherings which are sources of danger, but, as the pilgrim committee of Madras have rightly pointed out, the smaller festival centres in out of the way places are of no less importance.

The festival centres may conveniently be divided into :—

- (a) the places of perennial pilgrimage, and
- (b) temporary camps specially erected for periodical fairs and festivals.

The former possess some special religious sanctity apart from the occurrence of holy days. They continually attract pious people from different places. Kalighat, Benares, Puri, Rameswaram and many others may be cited as examples of such centres. The latter type of centre comes into prominence only on certain days in the year and, more particularly, periodically after a number of years. The attractions to these places are as much secular as religious. Kumbhs and Adha-Kumbhs at Hardwar and Allahabad are the best examples. Ardhodaya Joga festival on the Ganges and the Sagor Mela, the Puskaram fairs along the bank of the Godavari and Krishna are also similar in nature. Names of some of the important fairs held in different provinces along with average number of persons attending them, the time of the year when they are held, and the duration of the festivals are shown in the annexed table which may be of interest.

#### *Control measures*

Although the importance of the fairs in the spread of infection, particularly of cholera, was recognized long ago, it was only in recent years that earnest attempts were made to control them. People were used to looking upon these happenings as inevitable and the magnitude of the problem used to scare away the not-over-enthusiastic health officials. Even such a forceful personality as Sir Leonard Rogers once considered the sanitary control of fairs too

stupendous a task to be attempted with any chances of success. Thus, for a long time the custodians of the health of the people totally ignored the occurrences of the fairs. Dr. C. Plank, then Sanitary Commissioner of the United Provinces, for example, was unaware of the occurrence of the Kumbh fair, held at Allahabad in 1882, until he noticed a large number of people travelling by road to the fair grounds on the south-west of the city. The first determined attempt to move in the matter may be seen in the Puri Lodging House Act of 1871 which is in fact the precursor of the Bengal Municipal Act of the present day. Earlier attempts were mainly in the nature of medical treatment of minor ailments amongst the pilgrims. The medical subordinates who were deputed to these duties were neither capable nor properly equipped to cope with any serious outbreak of infectious disease. Up to the beginning of the present century the state responsibility in the control of the infectious diseases at the pilgrim centres was only partially recognized and it was left mainly to the local authorities to do what they could in the way of sanitary control of fairs. Sanitary inspectors were put in charge of public health organizations at the fair grounds and their efforts usually ended in complete failure. Apart from the insufficiency of funds and the lack of expert direction, the main reason for these failures was that no attempt was made to control the nodal points. Meanwhile the epidemic diseases continued to play havoc with the pilgrims. Pilgrim committees were then appointed in Madras, Bihar and Orissa, Bombay, United Provinces, etc., and their reports were forwarded to the Government of India in 1916 by the Sanitary Commissioner with the following remarks :—

#### *Medical arrangements on railways :—*

Along all the main lines there should be properly appointed stations where patients must be removed if suffering from any infectious disease. They should not be removed at places where no facilities for treatment exist. On the whole, all the pilgrim committees consider that the railway should be responsible for removing the patients and sending them to the hospital, but it is advisable to have the hospitals under the local civil authorities.'

This was the beginning of the suggestion of the much-needed joint action by the various public health authorities. The decentralization of sanitary services effected by the Reforms Act of 1919 threatened to kill this germ of joint and organized action by different provinces and other bodies responsible for the health of the people. Luckily, however, the provincial public health departments recognized the importance of joint action and successfully extended this principle to certain fairs of all-India importance. How successful such a policy has proved to be is best illustrated by the brilliant achievements

at the Kumbh and Adha-Kumbh fairs held at Allahabad in 1930 and 1936 respectively. I attended the Adha-Kumbh fair held early this year at Allahabad, and a short account of this fair will, I think, be of interest.

A fair is held annually at the confluence of the Jumna and the Ganges south of Allahabad, during the months of January and February. It assumes special importance every 12 years when it is known as the Kumbh fair. In between two Kumbhs, Adha-Kumbh fairs are held which are somewhat less important than the former and usually attract a smaller number of people. Thus the Kumbh and the Adha-Kumbh alternate at an interval of six years. The 1936 Adha-Kumbh began on Puranmashi day on the 8th January and lasted for one full month up to the next Puranmashi, *Makar Shankrant* on the 14th January, *Amawasya* on the 24th January and *Basant Panchami* on the 28th January were the chief bathing days on which the expected number of bathers were estimated as 200,000, 1,500,000 and 500,000 respectively. Actually, however, a much larger number visited the fair. The resident population in the *mela* area was expected to be in the neighbourhood of 30,000 on *Makar Shankrant* and 50,000 on the *Amawasya*.

For the sake of convenience the public health arrangements may be divided into three parts :—

(1) Prevention of importation of infection into the *mela* area and the control of nodal points in connection with the incoming pilgrims.

(2) Sanitary control at the fair grounds.

(3) Prevention of the spread of infection through the returning pilgrims.

To ensure the co-operation and joint action by the public health services of the adjoining provinces and of the railway authorities a joint meeting of the Directors of Public Health of the Punjab, United Provinces, Bombay, Central Provinces, Bihar and Orissa, and Bengal and of the Chief Medical Officers of the E. I. Railway, B. & N. W. Railway, and G. I. P. Railway is held a few months before the fair. Arrangements are made to draw the attention of the intending pilgrims to the dangers involved in proceeding to the fair. They are induced to get themselves inoculated against cholera before leaving their homes. Arrangements are made at important railway stations in their own provinces for medical inspection before the pilgrims entrain for Allahabad. Similar arrangements are also made for medical inspection at boundary stations and at stations *en route*, viz, Moghalsarai, Kashi, Benares, Benares Cantonment, and Ajodhya, and also at stations in Allahabad, viz, Allahabad Junction, Allahabad Sangam, Prayag, Prayag Ghat, Phaphamu, Allahabad City, Izat Bridge and Jhusi.

At Moghalsarai, Jhusi, and Phaphamu eight, four, and one cholera beds, respectively, are provided in huts specially erected for the purpose

with the object of segregating the pilgrims found to be suffering from cholera. Four additional smallpox beds are provided at Moghalsarai. The patients detained at other railway stations are removed to the nearest municipal infectious diseases hospital, the railway infectious diseases hospital at Naini or the special infectious diseases *mela* hospital, as the case may be. For pilgrims travelling by road arrangements for the detection of cholera and smallpox cases and their detention in suitable hospitals are made at Jhusi on the Grand Trunk Road, at the junction of Grand Trunk Road and Fort Road, at the bund near the Mori-Daraganj and at the junction of the Bund and the Tribeni roads near the carriage stand. A party consisting of a medical officer, a peon, two vaccinators and one sweeper is posted at each of these places. A supervising medical officer is also appointed to maintain these services efficiently.

The district boards of Allahabad, Fatehpur, Jaunpur, Pertabgarh, Mirzapur, Benares and Faizpur are made responsible for the repairs of roads, camping grounds, wells and tanks situated within their jurisdiction. The wells are disinfected before the commencement of the *mela* and this service is repeated as often as necessary. At the recommendation of the Director of Public Health grants-in-aid are given by the Government to these boards for the improvement of the wells. The municipal boards of Allahabad, Benares, and Faizabad are asked to augment their medical and sanitary staff and enforce sanitary measures in connection with the temporary camping grounds for pilgrims within their limits. Special attention is paid to the prevention of over-crowding and to the provision of proper sanitary arrangements in the *sarais* and other lodging houses. A watch is kept for the detection of cases of infectious diseases.

The *mela* area consists of the beds of the two rivers. It is a triangular piece of land, the base of which is formed by the Fort Road, and the two sides by the Jumna and the Ganges. The Izat Bridge on the Ganges and the Jumna Bridge form the upper limits and a point half a mile below the confluence of the rivers the lower limit within which they are under sanitary control. Jhusi village across the Ganges and Arail on the other side of the River Jumna are also included in the *mela* area. Soon after the rains this area is cleared and laid out for the *mela*. It is divided into five sanitary circles :—

Circle I the area above the bund.

" II Ganga Patti.

" III Jumna Patti.

" IV Jhusi.

" V Arail.

The central road, which is the continuation of the Tribeni Road, separates the Ganga Patti from the Jumna Patti. Each circle is laid out into small square or oblong plots surrounded by cross roads. In circle I, general offices,



exhibitions, *sabha pandals* and parking grounds are located while in the other circles plots are allotted to different parties of pilgrims, the requirements of the bigger parties and *akharas* having been ascertained beforehand.

**Conservancy.**—Public latrines are provided in the form of trench latrines which after use are filled in with mud and a layer of lime over which is placed a covering of gunny bag soaked in tar. Additional clay is heaped up and painted white to prevent persons from trampling over them. Each trench is 72 feet long, 1 foot wide, and 4 feet deep and accommodates 24 seats. Two hundred trench latrines in 40 sets of 5 each are provided yielding a total of 4,800 seats. To prevent caving in of the walls planks of wood are laid on either side of the trench. They also act as foot-rests. Private latrines of similar type are permitted in special cases. A hydrant is fixed near each trench. Sweepers are in attendance at all latrines to keep them clean, to fill up the used ones, and to dig new trenches. The trench latrines answer the purpose very well and are quite popular except with a certain sect of *sadhus* who refuse to use them. For this group enclosures known as 'flagged areas' are provided from where excreta are collected by sweepers and removed to the nearest trenches. No promiscuous defiling of the grounds is permitted. This is accomplished with the help of sanitary police.

Four hundred urinals are provided in suitable places. They consist of small enclosures in which an oblique funnel-shaped tube is buried in the ground, the lower end of which opens in a soakage pit.

Rubbish and garbage are collected by the conservancy staff and deposited in dust-bins placed at suitable locations. The contents are removed to rubbish pits, 60 of which had been provided. The final disposal is effected by burning on the spot. A quicker disposal of rubbish could probably be accomplished by providing tubular openings at the bottom to act as under-drafts.

With the sacred bathing, the ceremony of shaving the head is linked up. This operation is permitted only in a special enclosure, known as *Naibara*, where sweepers are detailed for collecting the hair in gunny bags and removing it to boats for dumping in the river at some distance down the confluence. Special *domes* are engaged to remove the animal corpses and unclaimed dead bodies for disposal. The cremation is performed at the *ghats* on the bank of the Ganges.

#### Water supply

Water is derived from two deep tube-wells which are permanent constructions above the *bund*: each yields 2,500 gallons per hour. The water is stored in an overhead reservoir from which it is distributed throughout the area, particularly along the banks of the river.

#### Medical relief

A large area on the Jumna Patti is enclosed to house the main hospital for general diseases. The outdoor department is situated on the main road. Altogether 90 beds are provided, 20 of which are reserved for women and 10 for the police force. The indoor accommodation takes the form of small isolated huts accommodating four beds each. This arrangement is cumbersome from the administrative point of view, but it has been adopted as a precautionary measure against an outbreak of fire—the huts being made of dry hay stalks and bamboos.

An outdoor dispensary is also provided for the use of the police force in circle I.

A similar 90-bed hospital is located in the Ganga Patti. This serves as the infectious diseases hospital. A Servian-barrel disinfecter has been set up in the compound. Exposure to cold winds is, however, likely to reduce its efficiency. Only three cholera cases were admitted into this hospital during the fair. A camp laboratory is attached to this hospital.

Besides the two main hospitals there are two branch hospitals at Jhusi and Arail. The former consists of four beds for infectious diseases and four for general diseases. At Arail there are only six beds, two being reserved for infectious diseases.

Ambulance services have been provided.

**Voluntary aid.**—*Sewa Samity* provides first aid and arranges to remove the patients to the hospital. Three dispensaries have been opened by voluntary agencies where free treatment is given.

**Light.**—Electric light has been supplied throughout the *mela* area. This is a great improvement on previous *melas* inasmuch as it reduces the chances of fires and greatly increases the efficiency of the conservancy staff and the sanitary police.

**Dust nuisance.**—Adequate arrangements have been made for watering the roads and there is no dust nuisance.

**Public health propaganda.**—Advantage has been taken of this gathering for purposes of public health education. An extensive and attractive exhibition has been organized by the Assistant Director of Public Health Propaganda. The model demonstrating the efficiency of quinine in malaria is particularly impressive. Many lectures on public health topics are broadcasted by the aid of a megaphone. Cinema films are shown at night. A film describing the Pertabgarh Health Centre is particularly interesting. These films attract large crowds who have to sit there for hours. There is a possible danger of exposure to cold in the open *maidan* where these demonstrations are held.

#### General administration

An Assistant Director of Public Health is in general charge of the sanitary and medical arrangements. He possesses extensive powers



*List of important fairs and festivals in India (by provinces)*

Serial number	Province.	Name of the fair	Locality	Permanent or temporary	Number of persons attending	Interval at which held	Duration	REMARKS
1	Bengal	'Shivaratri' festival.	Tarakeswar, Dist. Hooghly.	Permanent	30,000	Yearly	2 days	
2	"	'Rathajatra' festival.	Mahesh, Dist. Hooghly.	"	100,000 to 250,000	"	15 "	
3	"	'Gangasagar' mela.	Dist. 24-Per-ganas.	Temporary	50,000	"	3 "	
4	"	'Astami Snan'	Nangalbundh, Dist. Dacca.	"	40,000	"	4 "	
1	Bihar and Orissa.	'Ratha Jatra' festival.	Puri	Permanent	300,000	"	9 "	
2	"	'Pitripaksh' mela.	Gaya	"	200,000	"	18 "	
3	"	'Kartick Asnan' fair.	Sonepur, Dist. Saran.	Temporary	400,000	"	14 "	Claimed to be the largest cattle fair in the world.
1	United Provinces.	'Dikhauti' fair.	Hardwar	"	300,000 (in 'Kumbh' years).	"	14 "	'Kumbh' and 'Adha-Kumbh' at usual intervals.
2	"	'Magh' mela	Allahabad	"	3,000,000 (in 'Kumbh' years).	"	One month in 'Kumbh' years.	
3	"	'Dadri bathing' festival.	Ballia	"	400,000	"	2 weeks	
4	"	'Garhmukhteswar' fair.	Dist. Meerut	"	..	"	..	
5	"	'Savan Jhula' fair.	Ajodhia	..	..	"	2 weeks	
6	"	'Ram Naumi' fair.	"	..	..	"	..	Occasional fair.
7	"	..	Benares	Permanent	..	..	..	
8	"	..	Muttra and Brindaban.	"	..	..	..	
1	Punjab	'Kata's' fair	In the salt range.	Temporary	50,000	"	..	
2	"	'Sun eclipse' fair at Kurukshetra.	Thaneswar	"	500,000	..	..	A periodical event, occurring at the time of a partial or complete eclipse of the sun.
3	"	'Phalgu' fair	Dist. Karnal	..	100,000	..	..	
4	"	'Guru Nanak' fair.	Nankana Sahib	..	100,000	..	..	
1	C. P. and Berar.	Mahadeo Cave fair.	Panchmari Hills.	..	100,000	..	..	Total of 118 fairs in C. P.
1	Bombay	'Sinhasta' fair	Nasik	Temporary	1,000,000	12-yearly	13 months	One of the four 'Kumbh' centres.
2	"	'Ashidi' fair	Pandharpur	..	143,000	Yearly	..	
1	Madras	'Godavari Pushkaram'.	Rajahmundry	Temporary	1,000,000	Periodical	20 days	All these are 12-yearly festivals but come off together within 12 to 15 months of each other.
2	"	'Kistna Pushkaram'.	Bezwada	"	"	"	12 "	
3	"	'Mahamakham'	Kumbakonam	"	"	"	1 to 2 days	
4	"	"	Rameswaram and Tirupati.	Permanent	..	..	..	

under the Indian Epidemic Diseases Act, 1897. He is assisted by a deputy and by medical officers in charge of circles. Special medical

officers have been detailed for hospitals, field laboratory and supervision of arrangements at the railway stations in Allahabad. The medical

officers in charge of the circles are assisted by vaccinators, jamadars, beldars, mates, and menials in the discharge of their duties. Besides proper maintenance of the sanitary condition of their areas, these officers are responsible for the detection of cases of infectious diseases and their removal to the hospitals.

I have tried to give you a brief sketch of the medical and sanitary arrangements made at the Adha-Kumbh mela held in January and February 1936, but an adequate idea of the success of these measures can only be obtained by a personal visit. The standard of general cleanliness is very much higher than in an average Indian town. Flies are conspicuous by their absence. The danger of extension of an epidemic is reduced to a minimum. The pilgrims feel safe and comfortable. These fairs may, in fact, be looked forward to an occasion

for physical and mental rest as much as a source of spiritual gain. This is no mean achievement. Rai Bahadur Dr. K. P. Mathur, the present Director of Public Health, United Provinces, who as Assistant Director was in charge of the sanitary and medical arrangements of the fair, is to be congratulated on his successful administration and also his staff.

Time does not permit me to dwell on the sanitary arrangements at a centre of perennial pilgrimage but what I have said is enough to show how much can be accomplished in the way of saving human life and enhancing the happiness of the masses under most difficult circumstances, if only an earnest attempt is made under suitable direction, and the community places sufficient funds of goodwill and material resources at the disposal of public health authorities.

## Medical News

### THE SOCIETY FOR THE STUDY AND PROMOTION OF FAMILY HYGIENE INCLUDING SEX HYGIENE

THE Society for the Study and Promotion of Family Hygiene gives training in practical contraception to doctors and nurses who are members of the society. The fees are Rs. 25 for doctors and Rs. 15 for nurses in addition to the membership fee of Rs. 12 a year.

The society has also for hire to medical groups three cinema films on the technique of birth control including demonstrations on a living subject, the hire charges being Rs. 50 only.

For particulars apply to the General Secretary, Kodak House, Bombay 1.

### PRESIDENTIAL ADDRESS TO THE BENGAL PHARMACEUTICAL ASSOCIATION

GENTLEMEN,

It is my duty in the first instance to express my appreciation for the honour you have done me by asking me to be your president for the second time during these few years. My duties at the School of Tropical Medicine make such a heavy demand on my time that I felt considerable hesitation in accepting it. My interest in the question of organization of the profession of pharmacy in India has, however, prevailed upon me once more to accept your offer. At the same time I cannot help feeling that perhaps someone with more leisure could have been found who would have done justice to the duties and responsibilities connected with this office at a time when important changes are taking place in order to lay the foundation for a profession of pharmacy in India. For my part, I can assure you that so far as it lies in my power, I will, with your co-operation and help, do my best to further the interests of the association.

It is with a sense of deep sorrow that I refer to the untimely death of Mr. H. Cooper. A member of the Pharmaceutical Society of Great Britain, engaged in manufacturing pharmacy in India for well over a decade, Mr. Cooper was genuinely interested in the uplift of the pharmaceutical trade, profession and industry in this country. At my request he undertook the onerous duties of guiding the destinies of the Bengal Pharmaceutical Association during the first year of its existence. At this formative stage when the Association needs

guidance from a pharmacist of mature experience and ripe judgment, such as Mr. Cooper could give, his death is most unfortunate and regrettable. I feel it as a personal loss, as he was not only a friend but a member of the Drugs Enquiry Committee over which I had the honour to preside a few years ago. Before that he was also associated in the work the School was doing in connection with the important problem of investigation into the drug resources of India. We deeply regret his loss and offer our sincere and respectful condolences and sympathies to Mrs. Cooper in her bereavement.

#### *The root of the evil*

In 1934, when I was elected your president, I had the honour of presiding at your annual meeting in this very hall. Your association was called the 'All Bengal Compounding Association'. You decided at that time to change the name to 'Bengal Pharmaceutical Association' and this change of name brought with it a significant change in the activities of the association, that was undoubtedly a move in the right direction. Though at the present time no organized and self-contained profession of pharmacy is in existence in India as in other civilized countries, during the last two years there has been unmistakable evidence of an urge on the part of the association to improve the existing conditions. The evidence produced before the Drugs Enquiry Committee regarding the character and quality of the work turned out by the profession as a whole in this country was far from being complementary, as you are all well aware. The committee, after careful consideration, came to the conclusion that two things accounted for the regrettable state of affairs which existed—firstly, the lack of educational qualification of those who took up the profession and, secondly, the absence of restrictive laws preventing the practice of the profession by unqualified persons. These were the root of the evil. The committee considered that if something could be done to effect improvement in these two directions, pharmacy as a profession would be lifted from the deplorable condition in which it found itself and would be able to take its proper place by the side of the honourable and dignified profession of medicine in this country.

#### *Training of the pharmacists*

During the last few decades considerable changes have taken place in the practice of the profession of

medicine. Knowledge of medicine has made enormous and rapid strides and this is reflected in the medical curriculum of the present day. The medical profession in India has tried to move with the times and has embodied and incorporated much that is necessary to build up a generation of professional men equipped to carry on the modern teaching and practice in its various branches. That is the reason why the medical profession in this country has held its place. Unfortunately the same cannot be said about the profession of pharmacy. In order to build up a profession in the true sense of the word, the first and perhaps the most essential prerequisite is training of its members. Both 'medicine' and 'pharmacy' are professions which aim to serve the public and 'to serve well' should be the keynote of both. The profession of medicine has attempted to move, as far as possible, with the changing conditions. The profession of pharmacy has lagged behind, through no fault of its own perhaps. That is the reason why it is in such a deplorable condition in India to-day. Pharmacy is intimately related to medicine and it may be said without contradiction that the practice of pharmacy is an integral part of the practice of medicine. One cannot make much headway without the other going ahead also. The present position is therefore untenable.

It is essential, therefore, that the training of the pharmacist should be improved to enable him to discharge in a full measure the responsibilities attached to his profession. He should equip himself to take his place side by side with the members of the allied profession. In Great Britain, United States of America and in many countries on the Continent of Europe, an elaborate and efficient training is enjoined before anybody is allowed to practice the profession of pharmacy. Such an elaborate system would be ideal if it could be transplanted here *in toto*. But like all ideals, it should be approached with caution. The conditions in India are vastly different and modified methods are needed to cope with the situation as it exists in this country. With full realization of all these difficulties, the Drugs Enquiry Committee worked out a suitable curriculum for adoption in India and I am glad that this association has fully supported it and has made admirable attempts to see that these suggestions are given effect to at the earliest opportunity. Your representations have borne fruit and in Bengal, at any rate, the Governing Body of the State Medical Faculty have accepted the improved curriculum and it is now before the Government of Bengal for approval. I have every hope that this curriculum, which involves a training for two years, would be found suitable and will be put into practice in the near future. As time goes on and more specific demands arise, the provisions are elastic enough to incorporate other important and significant alterations and additions.

#### *The basic qualification and curriculum*

You will all agree that a preliminary basic qualification is necessary in order to provide a basis for scientific studies. It is essential therefore that an intending pharmacist should have this basic knowledge and to enable him to do this he should possess a matriculation certificate or an equivalent qualification before beginning his professional studies. The first year should be spent in the study of elementary botany, physics, chemistry both inorganic and organic and pharmaceutical arithmetic. There is always the danger of teaching too much or too little and it is difficult to set up the exact standard. To avoid these difficulties, definite courses have been presented which will avoid confusion and meet with the requirements. In the second year's course, along with other important subjects, a course in elementary pharmacology is included. So long as it was thought dangerous to teach the pharmacist anything of the sciences on which medicine is based, so long was the pharmacist placed in a ridiculous position. It is impossible for any man to carry on his work intelligently unless he knows its purpose. It is therefore impossible for the pharmacist to prepare

and dispense medicaments intelligently unless he knows something of their nature, action and use. Recent advances in materia medica have made the truth of this statement indisputable. If the pharmacists are to discharge their duties properly they must have the knowledge to understand the principles underlying the manufacture of medicaments used in modern medicine. The days of compounding simple mixtures and of making elegant preparations by addition of flavouring agents are gone and, if pharmacists wish to keep abreast of the times, they must keep in touch with the rapid advances in medicine and pharmacology. Pharmacy should supply the knowledge concerning drugs and preparations required in medical and veterinary practice and it should move on with the new orientation of therapeutics.

#### *Legislation—'Pharmacy and Drugs Law'*

So much for the curriculum and training. But improvement in the standard of training and qualification will not be effective in the absence of restrictive laws controlling the exercise of the profession. If the properly qualified pharmacist is not protected from charlatans, it is feared none will care to enter the profession seriously and face the unfair competition. What is the present position with regard to this? Those of you who were present at the annual meeting two years ago will remember that I laid great stress on the fact that the legislature in this country has not passed any act dealing with pharmacy. The Indian Poisons Act, the Opium Act, and the Dangerous Drugs Act only partially control the manufacture, sale, possession and import of certain drugs, but have no relation to the practice of pharmacy. They do not ensure that persons selling or keeping open shops for retailing, dispensing or compounding of poisons and narcotics should possess a competent knowledge of their business. In a few provinces chemists' shops are obliged to employ qualified compounders for compounding, dispensing and selling drugs under provisions of the Municipal Acts, but in most of the provinces there are no regulations whatever. In those provinces where Municipal Acts are in existence provisions requiring the registration of shops for sale of drugs and prohibiting the practice of the profession by unqualified persons are included. In actual practice, however, the machinery to see that the provisions of these acts are enforced is very inadequate and the actual state of affairs is not much better than the provinces where there is no enactment.

#### *Quality of drugs in the Indian market, and drug industry*

There is also no legislation to control the quality of drugs; the result is that the market in India is flooded with drugs and chemicals of defective strength and impure quality by unscrupulous traders and that potent remedies such as organo-metallic compounds, sera and vaccines are being freely sold without their quality having ever been tested. It is well known that certain firms abroad manufacture cheap and inferior quality drugs specially for the Indian market and are able to undersell the local manufacturers of drugs in this country. This dumping of drugs of inferior quality has its repercussion on the quality of drugs manufactured in India in that the quality is deteriorated to keep pace with the competitive rates of dumped goods. A class of manufacturers has arisen who make and sell inferior and sometimes absolutely inactive products. This substitution of genuine medicinal products by rubbish has now reached a very serious stage and is a source of grave danger to the country.

I consider that it is the duty of an association like this to press for the necessary legislation as this question is intimately connected with the question of the organization of the profession of pharmacy in India.

#### *Need for co-operation and self-help*

Legislation is necessary but is not the only essential factor. A proper understanding and due regard for

the rights of everybody concerned are quite as important; these will act as stimuli and as correctives and will promote friendship and better service. Laws should be the expressed demands of the people as a result of interest and study of existing general good. If confidence, co-ordination and co-operation are ensured among the members of the profession the rest will follow. By improving your training, you will be able to bring better understanding amongst yourselves, and protective legislation is bound to follow in due course.

It has often been said that unless there are legal restrictions to protect the qualified pharmacist from being subjected to the unfair competition by unqualified persons, few people will care to enter the profession. A distinctive training would naturally require a distinctive treatment and, if such treatment is not forthcoming, disappointment will be the inevitable result, leading perhaps to a breakdown of the ethical standards by which alone the profession should be guided. While I fully realize the difficulties, I am one of those who believe that qualified pharmacists will be able to hold their own even without any protective legislation. As I have outlined in the Report of the Drugs Enquiry Committee legislation should have an all-India scope and should apply uniformly to all the provinces in India. Such an extensive legislation may take time. The only way to hasten the issue is to make the legislators and the public opinion in the country feel the sphere of usefulness of the profession of pharmacy. This can only be achieved by radically reorganizing the profession by improving the training of the pharmacist and fostering a spirit of service to humanity.

#### *Drugs Control Laboratory*

You are no doubt aware that the Government of India in consultation with the provincial governments have recently decided to open a Drug Control Laboratory at the All-India Institute of Hygiene and Public Health for the control of spurious drug traffic. This is the direct result of the recommendations set forth in the report of the Drugs Enquiry Committee. The establishment of this laboratory is bound to have a far-reaching effect on the profession of pharmacy in general and the drug trade in particular. By creating an effective check on the spurious drug traffic which is glutting India at present, it will exert a wholesome effect on the profession. May I venture to suggest that the present time is the most opportune for putting your house in order and for coming forward with all the help that the resources of your association can command to make the working of this unit a success. With machinery for drug control in working order, one may confidently hope that the medical profession and the public will derive immense benefit. The pharmaceutical profession, trade and drug industry will be gainers to a very considerable extent.

#### *The future*

I will not take much more of your time by going into details of many of the minor aspects of the profession of pharmacy. I have tried, in the short time at my disposal, to bring to your notice the most crying needs of the profession as it stands to-day and the means by which improvement can be effected. I have laid stress on the question of improving your training. There are some who will ask whether an improvement in training will add to a pharmacist's earnings. Will a more extended and more expensive training covering a period of two years give the pharmacist a professional income commensurate with the time and money spent on it? It may be argued by some that, after all, a pharmacist's function is to compound and not prescribe; why then should he bother about a more comprehensive training? My answer to that is that improved training will certainly bring about improvement in the avenues open for employment and will result in increase in wages. You have only to follow the progress made by the profession of pharmacy in the Western countries to see the truth of my assertion. If one pays a visit to the centres of drug manufacture

in Great Britain, Continental countries and the United States of America, one at once realizes what large openings there are for the pharmacists. The pharmaceutical industry is now making headway in India and there are bound to be openings, which will go to the pharmacists if properly trained and qualified persons are available. There will be demand for the service of trained pharmacists in hospitals, dispensaries and other public institutions all over the country. Pharmacists are being recruited in increasing numbers in the army and navy and efforts to increase their representation in the various government services are meeting with encouragement both in the United States and in Great Britain. That is bound to come in this country in the near future. The future of pharmacy in India, therefore, if it can be lifted from its deplorable position, is bright and there is no reason for a pessimistic outlook. The existing problems may be serious but are not of a nature which cannot be remedied by intelligent co-operation and self-help and genuine desire for the improvement of the status of the profession. The pharmacists should bear in mind that efficient service to the public should be their prime consideration and motto. It is reassuring to see that there is already evidence of greater interest and I believe that within the ranks of this association there are men with ability, courage, foresight and breadth of vision, who will help to solve the existing problems leading to the uplift of the profession and will cope with any which may arise in future.

R. N. CHOPRA, C.I.E., M.D., M.R.C.P.,  
BREVET-COLONEL, I.M.S.,

*Honorary Physician to H. M. the King.*

### THE TINNEVELLY DISTRICT MEDICAL ASSOCIATION, PALAMCOTTAH (AFFILIATED TO THE INDIAN MEDICAL ASSOCIATION)

#### *Health exhibition*

UNDER the auspices of the Tinnevely District Medical Association in connection with its monthly meeting at Koilpatti, on Sunday, 20th December, 1936, a health exhibition was arranged at the Loyal Mills, Koilpatti, for the benefit of the labourers and staff and their families. This was the first time a health exhibition had been held at these mills.

Lieutenant-Colonel T. S. Shastri, I.M.S., the president of the association, welcomed the visitors and explained to them the prevalence of infectious diseases such as cholera, smallpox, and tuberculosis, and how to prevent them. Dr. Beema Singh of the Ramnad District Medical Association explained in easy Tamil the gist of what Lieutenant-Colonel T. S. Shastri said in English, and elaborated on 'Birth Control' which is very necessary for the working classes.

Lieutenant-Colonel T. S. Shastri, I.M.S., then requested Mr. Ashworth, the manager of the mills, to kindly open the exhibition. Mr. Ashworth, in declaring the exhibition open, said that such exhibitions are very useful and instructive to the masses and encouraged his staff to take interest in their own sanitation, thereby promoting efficiency of work.

This was very much appreciated by the large gathering of about 400 mill workers and school children.

#### *Monthly meeting*

The Tinnevely District Medical Association held its monthly meeting on Sunday, 20th December, 1936, at the Government Training School, Koilpatti. Members numbering 25, including two women doctors, were present on the occasion. Seven members of the Ramnad District Medical Association were also present (as guests).

After tea, the meeting began under the presidency of Lieutenant-Colonel T. S. Shastri, I.M.S., at 6 p.m. The secretary read the minutes of the monthly meeting held at headquarters on the 21st November, 1936, which were passed.

The following interesting clinical cases were demonstrated:—

(1) A case of long-standing fæcal fistula, due to unoperated strangulated inguinal hernia.

(2) A case of osteomyelitis, great trochanter, in a boy.

The following specimens were shown:—

(1) A case of dermoid cyst of ovary.

(2) Fibroid uterus (suspicious of malignancy).

The notes on the (1) fæcal fistula and (2) osteomyelitis cases, operated on by Lieutenant-Colonel T. S. Shastry, I.M.S., at the Government Headquarters Hospital, Palamcottah, were read out by Dr. P. S. Srinivasan, L.M.P., sub-assistant surgeon of the hospital.

Dr. Miss A. Lazarus, L.M.P., read out case-notes on (1) ovarian dermoid and (2) fibroid uterus, which were operated on by Lieutenant-Colonel T. S. Shastry, I.M.S., at the Government Women and Children Hospital, Vannarpet.

The above four cases were fully discussed by the members. Then, the president explained in detail the clinical examination, differential diagnosis and operative technique of all the cases. Then he thanked the headmaster of the school for placing the school halls at the disposal of the association for holding the meeting.

He also thanked Dr. T. R. Ramachandran, L.M.P., for the excellent arrangements.

#### THE PARKES MEMORIAL PRIZE, 1936

MAJOR E. F. W. MACKENZIE, O.B.E., M.C., Royal Army Medical Corps, has been awarded the Parkes Memorial Prize for his investigations into the ammonia-chlorine process of water purification in the field, coupled with research carried out by him in connection with food supplies in India. By this work Major Mackenzie has achieved much in the advancement of military hygiene.

The Parkes Memorial Prize is awarded annually to the officer who is considered by the committee to have done most to promote the advancement of naval or military hygiene by professional work of outstanding merit, and is open to medical officers of the Royal Navy, the Army, and the Indian Army, with the exception of the professors and assistant professors of the Royal Naval Medical College, Greenwich, and of the Royal Army Medical College, London, during their term of office.

THE WAR OFFICE,  
LONDON, S.W.1.

22nd December, 1936.

## Current Topics

### Prognosis in Leprosy

By E. MUIR, LL.D., M.D.

(From the *Lancet*, Vol. II, 15th and 22nd August, 1936, pp. 391 and 448)

#### THE IMPORTANCE OF PROGNOSIS

LEPROSY is not a fatal disease. The patient dies from complications and neglect rather than from the disease itself. It is perhaps because of this non-fatality, and because the patient is afraid that he may be doomed to long years of suffering, perhaps more mental than physical, that he so much fears leprosy. He has heard of, or perhaps seen, lepers in their more repugnant forms. The word 'leper', or its equivalent in other languages, is associated with the last degrees of degradation and abhorrence. In India it is called 'the great disease'. The public and even the medical profession are unaware that leprosy may be a very mild disease, and that even without special treatment many cases recover completely.

Because of all these facts, a reliable prognosis is perhaps of more importance than in most other diseases. In many diseases the infecting organism varies in virulence under certain circumstances, such as repeated and rapid passage from host to host. There is no reliable evidence that the virulence of *B. lepræ* varies in this way. The two important factors to be estimated in making a prognosis in leprosy are the concentration and distribution of the bacilli in the body and the resistance of the patient to the infection.

As in tuberculosis, so in leprosy also, many are infected who never develop the disease. In others there are abortive clinical signs which appear chiefly in the form of macules during some period of debility, and disappear again when the general health is restored. In others again the disease is confined to a single nerve and its branches, the infection being unable to escape either through the epineurium or through the terminal branches in the skin. In some cases two or more nerves are affected in this way, but the disease is not generalized.

#### LOCALIZED INFECTION

The confining of the infection to one or more nerves is a sign of comparatively high resistance to the

disease. Clinically there are signs of thickening and tenderness of the nerves affected, and local neural signs in the form of sensory, trophic, and vascular changes in the skin, muscles, bones, and joints. In these cases the lesions may remain stationary for a considerable period of months or even years, or active signs may gradually disappear, self-healing taking place. If at any time, while infection still persists, the patient becomes seriously debilitated due to an intercurrent disease or other cause, there is always the danger of exacerbation and widespread generalization throughout the body. In India—and there is reason to believe that the same holds good in many other endemic countries—more than half the patients showing clinical signs of leprosy belong to this resistant class. In them the prognosis is favourable, and it is so in direct proportion to the restriction of nerve involvement. While in a certain number of cases the disease is abortive and self-healing, in many others special treatment is necessary for ultimate recovery. In all, the factor of most importance is the restoration, improvement, and steady maintenance of as high a standard as possible of general health.

#### GENERAL INFECTION

In contrast to the cases described above are those in which the infection is not confined to the nerves, but spreads through the skin and mucous membranes, invades the lymphatics, and involves the internal organs. This form of leprosy is much more actively progressive. At least to begin with, the clinical signs tend to be less conspicuous than those of the resistant form. For although the concentration of bacilli is greater, the tissue reaction to the bacilli both in the skin and in the nerves is considerably less. The disease is thus frequently able to spread throughout the body without attracting the attention either of the patient or of the physician. Later, as the concentration of bacilli increases enormously, more conspicuous lesions appear in the form of skin thickening and nodulation. This latter is the cutaneous form of leprosy. It is found in patients in whom resistance to the infection is low. In this form the nerves are also invaded—to a greater degree indeed than in nerve leprosy—but, as tissue reaction in the nerves is absent or only slight, the sensory, trophic, and other signs dependent on neural involvement are also comparatively slight.



In this connection it should be stated that leprosy is a disease of exceedingly low toxicity. Its signs and symptoms are due not to toxins set free in the circulation but to the tissue reaction which the presence of *B. lepræ* excites locally. The local response to *B. lepræ* is in direct proportion to the local concentration of *B. lepræ*; but a much more potent factor in determining the cellular reaction is the resistance or immunity of the patient, which varies greatly in different cases.

We have indicated the two chief types of leprosy; the contrast between them is chiefly due to the degree of resistance, which is high in the former or neural type, and low in the latter or cutaneous type. As, however, in many cases the resistance varies considerably from time to time the signs of both types may be present at one time forming the *mixed* type of leprosy.

#### FACTORS INFLUENCING RESISTANCE

It will be plain from the above that the prognosis depends very largely on the resistance of the patient. There are four main factors which influence the degree of resistance:—

1. Natural resistance to leprosy is strong in healthy adults. Human leprosy has never been transmitted to experimental animals as a progressive disease, and their high resistance is apparently shared by healthy human adults. Also as with most other infectious diseases the degree of natural resistance to leprosy is probably greater in some subjects than in others, apart altogether from the state of their general health. It has been stated by some writers that this natural resistance not only applies to the individual, but also that in areas where leprosy has for a long time been endemic the more susceptible are gradually eliminated, and that thus race immunity is evolved. While this may be argued from the analogy of certain other diseases, there is but little direct evidence in its support.

2. Natural immunity is most markedly influenced by the age factor. In early childhood the resistance to leprosy is very low. Our recent surveys in Calcutta and in the Bankura District of Bengal show that children who have lived in close contact from their earlier days with infectious relatives or servants, in households where special precautions were not taken, seldom escape the disease; and the majority develop the severe infectious cutaneous type of the disease. Other children and adults exposed apparently to the same infection commonly either escape the disease or develop mild non-infectious lesions of the neural type.

Children infected in the first few years of life often show the 'juvenile' type of the disease. Slight depigmented macules with roughening and keratosis of the surface of the skin appear on different parts of the body from time to time, but bacteriological examination of these lesions is generally negative. About the age of puberty these macules may disappear permanently with recovery of the patient, or they may develop and show the cutaneous and infectious type of the disease; much depends upon the general health as the determining factor.

3. Most of those infected after the susceptible age-period—say after the tenth year—escape the severe and infectious type of the disease. If, however, the general health is severely depressed, or is even slightly depressed for a long period, the cutaneous (severe) type of the disease may develop. Such depression of health may be caused by a variety of causes; complicating diseases, dietary errors, pregnancy, etc.

4. Another cause of weakened resistance to leprosy is of a more specific nature—viz, the increase of the infection in the body beyond a certain degree. Thus a vicious circle is produced, the bacillary concentration facilitating the further increase of bacilli and paralysing the mechanism which would arrest that increase.

In contrast to the above is the effect of small infections, which generally tend to increase or supplement the natural resistance. Thus, in patients who have passed the age of increased susceptibility and are in fairly good health, contact even with highly infectious cases may, with or without the appearance of

mild leprosy lesions of the neural type, develop an acquired immunity. Even in healthy young children this specific immunity may be formed, provided that contact is not too frequent and the degree of infection be not too great.

Among healthy adults there tends to be a considerable hiatus between what we term 'resistant' and 'non-resistant' cases. In the former the disease frequently dies out or remains stationary for long periods of years without showing any tendency to increase; in the latter it tends to progress. The hiatus between the resistant and non-resistant cases may be broken down by anything which impairs the general health.

In determining the resistance of the patient we rely chiefly upon the clinical and bacteriological examination. In addition, however, the leprolin test is of considerable value, and the erythrocyte sedimentation test is of great use in estimating the general resistance.

The prognosis may be conveniently divided under three main heads: (1) In infectious contacts (contacts with infectious cases) without signs of the disease, what is the likelihood of leprosy developing? (2) In those in whom leprosy has developed, and definite signs are present, what are the chances of recovery? How long will it take, what are the chances of relapse, and will recovery take place with or without deformities and disablement? (3) How long should treatment be continued after active signs have disappeared, and how long should the patient be kept under observation?

#### INFECTIOUS CONTACTS

We use this term to indicate those who have been in contact with infectious cases of leprosy but who have not so far shown any signs of leprosy.

The factors which determine the danger of contact are its closeness and duration, the infectiousness of the case, and the age and general health of the person exposed to contagion. Thus a debilitated adult or a young child may occasionally acquire the disease after even short or slight contact with a highly infectious case. Undoubted cases are also known where dwelling in a house vacated by a leper, or use of furniture formerly used by a leper, have been followed by the appearance of leprosy. Fortunately the danger of contracting leprosy in Great Britain is now very slight. Besides those who have recovered from the milder forms of the disease, there are probably about one hundred patients with active leprosy in Great Britain at the present day. With few exceptions these have contracted the disease in our colonies, or in other tropical countries. Some twelve are in a leper home in Essex; the rest live in their own homes. There the simple precautions taken are sufficient to prevent the spread of infection.

Leprosy is far less communicable than tuberculosis. Chiefly for this reason the former disease in an endemic form died out from England centuries ago, while the latter is still prevalent. That is why leprosy is not a notifiable disease, and thus we have no exact figures regarding the few cases that still remain.

In making a prognosis the most important point to be ascertained is the age when contact first took place. If this was within the first few years of life, and especially if there was prolonged and close contact with a highly infectious case, then, even though several years may have passed since then and no signs of the disease have been noticed, it is possible that a generalized infection may have taken place which will show itself sooner or later. If the reaction to leprolin is strong the prognosis is good; if the reaction is negative or weak the prognosis is unfavourable. In such cases careful clinical examination with the aid of a suitable light will often reveal macules which had escaped notice before; or careful and repeated bacteriological examinations of the skin or mucous membrane may show acid-fast bacilli.

In healthy adults who have been in contact with infectious cases and show no signs, the prognosis is as a rule much more favourable. If a considerable period has passed since contact took place then definite



signs of the neural type of leprosy would probably have declared themselves if infection were present in the body, but here too the leprolin test is of value.

In adults who are or who have been in a poor state of health, the danger of the infection developing is much greater. If there is a history of severe or prolonged disease or of other predisposing conditions during the interval since contact took place, if the sedimentation index is high, and if the reaction to leprolin is negative or weak, then a very guarded prognosis is necessary; clinical or bacteriological re-examination of the patient may reveal positive signs sooner or later.

#### PATIENTS WITH LEPROUS LESIONS

In making a prognosis the important points to ascertain are the degree of infection and the special and general resistance of the patient to the disease. All patients should be divided into resistant and non-resistant groups. It is important to go carefully into the medical history of the patient, especially with regard to predisposing causes; the general appearance, bacteriological examination, and the extent of the lesions may give a clear indication, and here again the leprolin and sedimentation tests should be used.

The following table gives the main distinctions between resistant and non-resistant cases:—

Resistant	Non-resistant
One or only few macules, with anæsthesia to light touch, and with pronounced erythema; thickening and induration of the skin either throughout the lesion or at the margin.	More numerous and widespread and flatter lesions without marked erythematous thickening or induration, the margin merging with the surrounding skin. Erythema less pronounced. Hypo-pigmentation is more noticeable.
Thickening and tenderness of the sensory or mixed nerves connected with the macules.	Nerve thickening as a rule not marked.
Generalized infection of the skin is never present, the disease of the skin being confined to a few macules.	In advanced cases skin involvement may be widespread covering the whole body, with no appearance of macules. While in some of these cases there is noticeable thickening and nodulation, in others it is difficult to recognize the presence of disease on inspection though bacteriological examination shows widespread infection.
Lesions grow slowly or remain stationary for long periods, often for years.	New lesions continually appear and macules grow rapidly in size and coalesce, until almost the whole skin is involved.
Bacteriological examination of the skin shows few or no acid-fast bacilli.	Bacilli are found in lesions of the skin and nasal mucosa in greater or smaller numbers.
There is strong reaction to leprolin.	Reaction to leprolin is absent or very weak.
In resistant cases the prognosis is excellent provided the patient remains in at least moderately good general health. The lesions should disappear under treatment in a comparatively short time (a few weeks to a few months); and the danger of relapse, once all signs of active disease have disappeared from the skin and the nerves, is very small, provided that the patient's general health is maintained.	
In non-resistant cases the prognosis is much more doubtful. If the general health is good, or if under	

suitable treatment it becomes good, and especially if the sedimentation of erythrocytes is slow, then a favourable though guarded prognosis may be given. The period of treatment necessary will, however, be much more prolonged. In many cases of low resistance a definite prognosis should be delayed until there has been time to observe the progress made under general and special treatment. The effective treatment of complicating diseases, along with the carrying out of a strict regime of careful diet, active and suitable exercise, and regular habits, is often found to bring about within a few months, or it may be in one or two years, improvement up to a certain point, after which the patient progresses steadily towards recovery, though several years may be necessary to get rid of all active signs.

#### RESIDUAL TROPHIC LESIONS

The question of recovery with or without permanent lesions and deformity is an important one for the patient. The earlier treatment is begun and the more carefully it is carried out, the less likelihood is there of the development of trophic lesions of the hands, feet, and face. Carefully planned physical exercise is very important in this connection. Nerve reaction in the ulnar and peroneal nerves, which so commonly results in claw-hand and drop-foot, seldom occurs in patients with firm well-developed muscles. In most cases a certain amount of anæsthesia and, if the larger mixed nerves have been involved, of trophic changes in the small muscles are likely to persist. These should not be mistaken for active signs of the disease.

#### PERIOD OF TREATMENT AND OBSERVATION

The length of treatment and the period of observation necessary after the cessation of treatment are matters of extreme importance. Treatment is frequently stopped far too soon, and relapse follows causing disappointment to the patient and loss of confidence in the treatment of leprosy.

In non-resistant cases clinical appearances are most deceptive. Lesions will often disappear as a result of complicating diseases, the depression of cellular reaction to *M. lepræ* giving a false appearance of improvement. Bacteriological examination should be carried out thoroughly and repeatedly till the results become negative in smears taken from all parts of the body before the disease is declared quiescent, and it should have remained quiescent for at least two years before it is declared arrested. Thereafter the patient, though he may resume his ordinary social life, should remain under observation for several years; for though bacilli may be absent from the skin and nasal mucosa, they may still remain present in the peripheral nerves. Until careful bacteriological examination is negative on repeated occasions, the patient should observe isolation at least as regards his room, furniture, and eating utensils. There is probably little danger from his travelling in public vehicles, unless he is a highly contagious case; but he should avoid having his meals with others, except at home where special precautions can be easily arranged. He should be specially careful to avoid contact of any sort with young children.

In resistant cases the necessary period of treatment and after-observation is much shorter. In most of them bacteriological examination is negative from the beginning or only very few bacilli can be found in the lesions. In such cases where careful and repeated bacteriological examinations have been consistently negative the criteria of quiescence and arrest must be based chiefly upon clinical examination: (a) lesions are flattened out, so that the finger on passing along the surface from the normal skin to the lesion cannot detect any raised margin, and the skin picked up between finger and thumb feels no thicker than the healthy surrounding skin; (b) thickened nerves lose their tenderness on pressure or percussion, and become reduced to their normal size; (c) no new lesions appear, and the original lesions no longer increase in size; (d) the areas of anæsthesia, though not entirely disappearing, remain stationary in size, neither increasing nor diminishing.

Lastly, in all types of cases and at all stages of the disease the mental outlook and equipment of the patient are of vital importance. The intelligent patient who is full of courage and determination to get better stands a much better chance than the stupid, lazy, or opinionated one. This is true of other diseases, but in none so much as in leprosy, in which the justification for mental depression is so great, and so much depends on the prolonged and persistent efforts of the patient himself.

## The Treatment of Asthma

By C. M. WILSON

(From the *Lancet*, Vol. II, 10th October, 1936, p. 872)

At one time a cold in the head infecting both antra left me with asthma although I do not come of asthmatic stock. I have now been free from asthma for some years, but my experience as an asthmatic stretching over some months has influenced my attitude towards treatment. My physicians spent a long time in examination of the chest, but only the smallest fraction of the consultation was devoted to treatment. Moreover they left me convinced that I had asthma for life. A middle-aged doctor contracting asthma is in no need of depressing doctrines, he himself will supply the note of pessimism.

Nothing is known of the asthma diathesis which is the essential factor in the pathogenesis of the disease. If it is due to some change in the chemistry of the blood we know nothing of that change. Accordingly the congenital abnormality at the bottom of the malady remains untreated. The effect of altitude is interesting in this connection, and this effect is seen if the patient goes up in an aeroplane just the same as if he lives in the Alps at a height of four thousand feet, suggesting that it is lowered oxygen tension or some such factor that leads to the biochemical changes which bring freedom to the asthmatic. The vast majority of asthmatics lose their asthma in the Alps, but it soon recurs on returning to lower levels. It is not therefore a very helpful line of treatment. But in the case of asthmatic children, permanent relief often follows a prolonged stay in the Alps. At such places as Montana, Villars, and Chateau d'Oex children can be educated in schools where English is spoken at no greater expense than at a good preparatory school when it is remembered that the child also spends his holidays in Switzerland. In people with the asthmatic diathesis certain stimuli—chemical, reflex, and psychical—lead to bronchial spasm. The chemical stimuli such as the emanations from animals and so forth raise the question whether skin tests are worth doing in an asthmatic. Dramatic results have followed the removal of noxious material or desensitizing the patient to the protein concerned, but skin tests have on the whole proved disappointing. Of the reflex causes of asthma, an overloaded stomach is a proverbial cause of trouble and there are places on the continent where the patient is allowed nothing to eat after 5 p.m.

As far as the nose is concerned, though many claims have been made, the results of treatment are not very encouraging. Everyone will agree that if there is infection of the sinuses it is likely to lead to bronchitis and that an attempt must be made to clear up the infection. If there is pronounced nasal obstruction due to a deviated septum or polypi there is something to be said for the provision of a clear air-passage when other methods of treatment have failed. The touching of the nasal mucous membrane with the cautery under cocaine is perhaps the most hopeful method open to the aural surgeon, especially if the nose appears healthy. But only a fraction of cases respond and relapses are common.

One can hardly exaggerate the importance of the mind in asthma. As a man may go to bed knowing that he has an early train to catch, so an asthmatic retires anticipating a nocturnal attack. For months I myself woke every night at 2 a.m. which could not

be attributed to any organic reason. An asthmatic must be weaned from his habit. Nothing else in the treatment of asthma is of the same importance as the discipline of the mind. The mental processes are familiar to anyone who has suffered from the disease. To those who happily have not learnt these processes by personal experience the letters of Disraeli to Lady Bradford will be instructive. Disraeli thanked God for the gout because he was generally free from asthma when he had gout. But when he was near the end Queen Victoria insisted on a second opinion. Kidd, his doctor, called in Sir Richard Quain, but Quain refused to meet a homœopath, and only consented to do so when it was represented to him that it would be disloyal to do otherwise. Even then he demanded in writing assurances that Kidd was acting under him and that Disraeli was being treated not by homœopathy but by allopathy. With these assurances Quain consulted the Head of the Profession and, receiving the 'All Clear', proceeded with Kidd step by step and arm in arm in hopefulness to hold their first consultation.

In the treatment of the actual attack adrenalin is most useful. The unpleasant palpitations following the hypodermic injection and the possible injurious effects on the blood pressure and arteries are avoided by giving small doses. One or two minims are adequate. Adrenalin can usefully be given as a vapour. Ephedrine has the advantage that it can be taken by mouth and that the effect lasts six or eight hours. The inhalation of fumes from burning such substances as stramonium is liable to irritate the bronchial mucous membrane, so that I never use this method in an attack.

In suitable patients the use of physical exercises in asthma is a more hopeful line of treatment than any medicinal remedies. The difficulty in asthmatic breathing is to empty the lungs which are overdistended. The first object of the exercises is to teach the patient how to do this by using the lower part of his chest and abdominal muscles and by diaphragmatic breathing instead of using only the upper part of the chest. Exercises should be carried out with the assistance of a masseuse who is an expert in remedial exercises. The art of treating an asthmatic is an individual art, but there is one secret common to all successful treatment and this is to teach the patient to discipline his mental processes. The consensus of informed opinion will probably now wish to add another discipline, the control of the respiratory movements.

## Cough in Children

By DR. ALAN MONCRIEFF

(From the *Lancet*, Vol. II, 10th October, 1936, p. 871)

THE commonest symptom in outpatient work in a children's department is undoubtedly 'cough', and I have thought it preferable to deal with this complaint rather than with any of the diseases in which it specially occurs. Not only is it the commonest presenting symptom in childhood taken as a whole, but as a rule it is not associated with disease in the chest, so that the average textbook dealing more particularly with disease syndromes does not adequately cover its more usual causes.

Viewed as a modified reflex act, cough can be regarded as always having somewhere a site of origin. I do not propose to deal in detail with the very interesting work which has been done in recent years on the relative sensibility of the various areas, but I must mention that the origin of the cough reflex is much more likely to be in the upper part of the respiratory tract—i.e., above rather than below the bifurcation of the trachea. The simplest way to consider the subject is to follow the respiratory tract down from its upper reaches and thus enumerate the different areas from which a cough may arise. Acute inflammation of the nose and nasopharynx comes first, and it is here that adenoids and infections of the nasal sinuses are of great importance. Pharyngeal coughs and tonsillar coughs

are probably the commonest you find in childhood, and it is well to realize that a cough rather than the complaint of a sore-throat is the presenting symptom in most cases of tonsillitis in the young child. It is just this type of cough which is diagnosed as bronchitis by the mother and often treated as such without medical advice; which, in the case of diphtheritic tonsillitis for example, may be a disastrous course.

The middle ear may strictly be regarded as a branch of the respiratory tract, but I doubt whether a cough ever arises as a result of ear disease alone, although I have been told of an instance where a foreign body in the external auditory meatus did appear to be the cause of cough. Next on the way down comes the larynx, and here the characteristic 'croupy' element generally makes diagnosis easy. In the child most laryngeal coughs are due to a combination of inflammation and spasm, and quite apart from the strict groups of laryngitis and laryngismus there are two conditions to be remembered of importance with a croupy cough. One is the early stage of measles in which the cough is probably due to Koplik's spots on the laryngeal mucosa and the other is retropharyngeal abscess. Arising from the trachea are a group of coughs—harsh, painful, ineffective—which are the end-results of an infection of the nose spreading downwards. Coughs of tracheal origin may also occur with an enlarged thymus or enlarged mediastinal glands. Inflammation of the bronchi may be associated with extraordinarily little cough; usually there is a certain amount of coughing, but it is noticeable that this diminishes as the finer tubes become affected and even more if the inflammatory process reaches the alveoli. Pneumonia, for instance, may be an almost silent disease, and such a serious malady as acute miliary tuberculosis gives rise to little or no cough. In speaking of tuberculosis I would emphasize that this disease as a cause of cough in childhood is comparatively rare.

Still further down, so to speak, comes the pleura, and a short period of irritating cough is a feature of the early dry phase of pleurisy. Of the other forms of cough, which do not appear in this list, whooping-cough is the most important. The diagnosis of this malady by means of the cough plate is becoming perfected, and I have found the sublingual ulcer of very great value, particularly in the early stages. The possibility of a 'stomach cough' is supported by certain experiments, but I think more often the cough and the gastric upsets have a common origin in the catarrhal state of the pharynx. Finally cough may sometimes be a habit spasm.

When the origin of a cough has been correctly diagnosed treatment becomes relatively simple. Clearly for coughs affecting the upper respiratory tract a sedative linctus is indicated in addition to measures dealing with the local infection. A useful prescription is (for a child of one year): tinct. opii camph., oxymel scillæ, and glycerin., ãã 10 minims; water to 60 minims; one teaspoonful as required. If there is evidence of bronchitis some expectorant mixture is usually employed, but I am coming to believe less and less in the value of these drugs. The commonly used tincture of ipecacuanha in doses of 5 to 10 minims is probably largely ineffective, while larger doses may seriously upset a child's digestion. Probably the best clinical measure in bronchitis is to give a copious supply of fluid to keep the bronchial secretion from becoming thick and retained. For the same reason a moist atmosphere is also beneficial, provided it is not allowed to get too warm; it is best obtained by steaming a kettle into the room at intervals while the temperature is not allowed to rise higher than about 65°F. to 70°F. Liniments applied to the chest are probably mostly of value because they lead to the child inhaling a certain amount of the medication vaporized by the warm body.

With recurrent bronchitis in the young child two points should be kept in mind as regards treatment. The first is that asthma often masquerades in this guise; the second, that the atmosphere of many houses

is dry and dusty and may predispose to inflammation of the delicate mucous membrane lining the respiratory passages.

## Hypnotic Drugs

By L. I. M. CASTLEDEN, M.D.

(From the *Practitioner*, Vol. CXXXVII, September, 1936, p. 358)

LACK of sleep, or imperfect sleep, is so common a symptom that most practitioners have frequently to treat it whatever their department of medicine may be. This together with the fact that the list of hypnotics is constantly growing both in length and in complexity make it desirable to have some kind of working classification of these drugs from which a suitable one may be chosen and into which new preparations may be fitted as they appear. This article aims at an attempt to produce a simple classification of this kind. At the outset it is well to remember that hypnotic drugs are not the only means available for producing sleep, neither should they be the first remedy to be considered. The normal physiology of sleep is not yet understood, but one of the simplest hypotheses is that put forward by Samson Wright, who states that it may be merely the damping down of the conductivity in the afferent and association paths of the nervous system. Such a conception, whilst probably not the whole truth, is of use to the clinician in that it serves as a reminder of the paths by which sleeplessness may come. There are the extero-ceptive impulses from the external environment of the patient through the surface of the body and the special senses; the proprio-ceptive impulses from the posture of or pressure upon muscles, bones and joints, and from the large group of visceral stimuli amongst which the cardiovascular, gastric and rectal are the most important. In insomnia due to these latter stimuli an alkali or carminative, if there is flatulence, or an enema, if the rectum is loaded, will produce sleep as readily as a hypnotic. Lastly there is the over-activity of the higher centres themselves, the psychic causes of insomnia, one of the commonest of which is the fear that sleep will not be obtainable and of the dire consequences that are likely to ensue. Correction of abnormalities in what may be briefly termed the external and internal environments of the patient may of itself prove to be a hypnotic measure. In spite of this correction, or because it cannot be wholly effected without them, recourse to hypnotic drugs will often be necessary.

### THE IDEAL HYPNOTIC

This would have the following properties:—

(1) It would be 'light', that is to say, readily absorbed so that a reliable effect is produced at a regular interval after administration.

(2) It would be rapidly broken down, but not too rapidly, or excreted so that, on the one hand, it would remain in the tissues long enough to ensure a sufficient length of sleep but, on the other hand, not so long as to cause drowsiness the next day or to produce cumulative effects if repeated daily.

(3) It must not produce side actions either unpleasant, such as preliminary excitement and gastric irritation, or dangerous, such as cardiac or respiratory depression.

(4) There must be a sufficient margin of safety between the therapeutic and toxic doses.

(5) The drug must not produce tolerance or habit when administered over long periods.

No drug possesses all these qualities or ever will, but each new hypnotic as it appears is said to be nearer the ideal and there is a real danger that the old, well-tried and reliable remedies are apt to be forgotten in the admiration of the new. Most of the new hypnotics are barbiturates; for this and other reasons they are best kept in a group by themselves. If the opiates are also placed in a separate group, the remainder will be

chiefly composed of the older drugs. These can be considered under the heading of mild and powerful.

#### THE MILD HYPNOTICS

(1) The analgesics, *phenacetin*, *phenazone*, *amidopyrin*, apart from allowing sleep by removal of a neuralgic or myalgic pain, have a definite mild hypnotic action. Particularly is this so with aspirin, which for most adults and nearly all children is hypnotic.

(2) The alcohols would come into this group, though their use for this purpose, except in the case of elderly debilitated patients who are already habituated to them, should be deprecated. *Amylene hydrate*, an alcohol with more hypnotic action than the rest, has fallen into disuse on account of the preliminary excitement it may induce.

(3) The *bromides*, though really sedatives, are useful in the insomnia of overwork, worry and agitated states. They are rapidly absorbed and more slowly excreted and so may give rise to some depression on the following day. They act by virtue of the bromide ion and so there is nothing to choose between the various bromides at our disposal. The slowness of excretion is due to the fact that the kidney cannot distinguish between chloride and bromide and so both are eliminated in the proportions in which they are dissolved in the tissue fluids, a property which is employed when it is desired to hasten the excretion of bromide. *Sedobrol* and similar proprietary preparations are broths containing sodium bromide in place of sodium chloride.

(4) The urea derivatives (other than the barbiturates) are *carbromalum* (*adalin*) and *bromural*, which, as their names suggest, are bromide urea compounds, and *sedormid*, which has no bromide in it. These substances are mild and light hypnotics, rapid and pleasant in action and without after-effects. *Bromural* has recently been revived by one of the drug houses and is being pushed as a safe hypnotic which is not a barbiturate; these claims are of course true.

(5) The carbonates, examples of which are *urethane* and *hedonal*, are so mild that for some adults they do not seem to be sufficiently potent. They are rapid, safe, have no after-effects and can with advantage be used for children.

#### THE POWERFUL HYPNOTICS

(1) *Paraldehyde* is well known and much used. It operates quickly, has no unpleasant after-effects, and the sleep it gives lasts several hours, being quiet, refreshing and dreamless. It has no depressant action on the heart or respiration and is of special value in delirium tremens for these reasons and also because it is closely allied, chemically, to alcohol. The only dangers in its use seem to be in cases of acute nephritis or when there is advanced cirrhosis of the liver. Objections to its use are the nasty taste and the odour it gives to the breath. These cannot be overcome but the former can be mitigated considerably by giving the drug as an emulsion in which form it is a much more elegant preparation than when merely added to water: 120 minims of paraldehyde can be emulsified in one ounce of water by the addition of 30 minims of tincture of quillaia. The best flavouring agent is liquorice.

(2) The sulphone group, *sulphonal*, *trional*, has justly become unpopular for the action is uncertain, because such drugs act better in some individuals than in others. Excretion of this group is slow, producing drowsiness the next day and a liability to cumulative effects if repeated doses are given. All members of this series are liable to produce liver and kidney damage and hematoporphyria.

(3) The halogen derivatives are some of the most useful sleep-producing drugs available. It used to be taught that they depress the heart in varying degrees and should therefore be used with caution if this organ is feeble, but recent work has shown that they exert no toxic action on the cardiovascular system in therapeutic doses. All are gastric irritants unless given well

diluted. None of them is of any use if insomnia is due to pain. *Chloral hydrate* is typical of this group. It is fairly rapidly absorbed, certain and reliable in action and very useful in simple insomnia or in that due to overwork or worry, especially if combined with bromide. Children take it well. A useful preparation that is not used so much as it might be is syrup of chloral which contains 10.9 grains in 60 minims. *Chlorbutol*, better known as *chlorctone*, has come to be associated with the treatment of sea-sickness and with its properties as a local anæsthetic, but it is a good hypnotic, having the same properties as chloral with less toxicity and less gastric action. *Chloralamide*, another member of this series, is an excellent hypnotic. It is, however, very insoluble, this property probably accounting for its lack of popularity for, unless given in suitable form, absorption and therefore action may be much delayed. There are three ways in which chloralamide may be given:—(a) As a powder, the patient being instructed to dissolve it in a little whiskey and then to add water. If this method is used then the prescription must be for *pulv. chloralformamide*. Should crystals be dispensed, as they may be if the powder be not specified, the patient, after stirring for some time, will either leave the dose at the bottom of the glass or, if conscientious enough to wash it all down, will spend a wakeful night and sleep most of the following day. (b) Each 60 minims of spiritus vini rect. added to one ounce of water will take up 10 grains of chloralamide in the cold. There are obvious pharmacological objections to such a mixture if a fairly large dose is intended. (c) Tincture of orange, 60 minims, with an equal quantity of simple syrup to each ounce of water will take up 30 grains chloralamide with 30 grains of bromide as well, which is as much as is ever required of this useful mixture. The only way to get the drugs into solution is to dissolve the chloralamide in the tincture with gentle heat and then to add the other ingredients dissolved in the requisite amount of water. Chemists seem to be afraid to heat chloralamide because heat dissociates it, but the temperature at which this happens is 130°F. which is above the boiling point of alcohol.

#### OPIMUM

Opium and its derivatives are so well known and so widely used as to need only a brief mention. They are all pre-eminently anodyne in action and are therefore the drugs of choice in the insomnia which is dependent upon painful conditions. They are also indicated in the sleeplessness which is associated with heart disease. Apart from these indications they are not good hypnotics. *Nepenthe* is an elegant and useful preparation one-third less strong than the official tincture and without the latter's resinous messiness when diluted. It has the advantage that its name does not suggest an opiate to the uninitiated patient so that it may be added to mixtures containing soluble hypnotics when it is desired to impart some pain-relieving quality to them and later withdrawn. *Omnopon* and *opoidine* are preparations of the total alkaloids of opium which are said to give fewer of the side actions such as nausea and constipation. *Omnopon* is certainly less nauseating to most patients who are affected that way by morphine. *Spasmalgin* contains a derivative of atropine, papaverine and *omnopon*. *Trivaline* is morphine and cocaine valerianate. *Dilaudid*, a new preparation, is said to have all the pain-relieving properties of morphine without having any other action. This unfortunately is only partly true but appears to be more correct than the similar claims for *omnopon*.

#### THE BARBITURATES

These drugs are best kept in a class by themselves because they exhibit properties and actions characteristic of a group which contains in itself a practically complete range of hypnotics. They are all substitution products of hypnotics. They are substitution products of malonylurea which is itself the product of the union of malonic acid with urea.

The malonic acid end of malonylurea has two hydrogen atoms either or both of which can be replaced by organic radicles, which may be of the paraffin series, methane, ethane, or propane having one, two, three and so on carbon atoms in an ascending scale, or of the phenolic  $C_6H_5$  group, or again of the acetylene series, e.g., allyl with three carbon atoms. It is obvious from these few examples of possible linkages that a great many permutations and combinations are possible. If, for instance, the two hydrogen atoms are replaced by two ethyl groups ( $C_2H_5$ ) the compound so formed, di-ethyl malonylurea, is *barbitone* or *veronal* itself. All such substitution products of malonylurea have a hypnotic action and it would seem that the fewer extra carbon atoms that are attached the lighter, i.e., quicker and shorter acting, the hypnotic will be, and, conversely, the more carbon atoms the heavier. A rough rule for guidance is that an ethyl or mythyl group in a barbiturate makes it a light one whilst a phenyl group makes it heavy, and these groups are the most common ones to find, in association with others, so that by looking at the proper chemical name of the drug, which is always printed somewhere on the package or in the literature, usually in microscopic letters, some idea can be obtained of its probable action. Examples of this are *soneryl*, a useful light hypnotic which is butyl-ethyl-malonylurea, whilst *pheno-barbitone* is *luminal*, so heavy, i.e., long and slow in action, as to be almost useless as a hypnotic but invaluable for other purposes because of these very properties.

Some barbiturates are soluble but most are not. If the sodium salt of any of their compounds is made it becomes soluble and therefore has its rate of action accelerated because solubility increases both absorption and excretion. An excellent example of this is *evipan* which has two methyl groups and which is rapid in taking effect and transitory in the drowsiness it produces. It is applicable to those patients who wake at 3 or 4 a.m. and cannot get to sleep again. Four grains by the mouth will produce three or four hours more sleep and the effects of the drug will be gone by the time the patient wakes again. *Evipan-sodium*, on the other hand, is so rapidly diffusible on account of the increased solubility that when injected into a vein its effects are over in about twenty minutes. There are about 168 barbiturates that can be used in medicine and it is possible in so short an article to mention only a few of them. Some have been dealt with as examples of the common structure, others in frequent use are *hebaral-sodium*, the soluble sodium compound of hexyl-ethyl-malonylurea, which is light, efficient and reliable, giving no heaviness the next day. It is an excellent preparation for bedtime use. Others are *dial*, which though light is not so mild a drug as it is popularly supposed to be, *barbitone* itself and its sodium salt *medinal*, *phanodorm*, *pernocton*, and so on through the series to the really heavy members, such as *luminal*, *luminal-sodium* and *prominal*. Certain barbiturates have found a special use in inducing sleep before anaesthesia, *nembutal* being the best known example. It is said that *hebaral-sodium* is useful in this respect and does not cause the excitement not seldom seen after *nembutal*, and that *amytal-sodium* is particularly indicated for premedication in children. This last drug has a special indication in that it may be given by intramuscular injection of an aqueous solution of three grains to calm the almost maniacal excitement sometimes seen in cases of exophthalmic goitre.

Idiosyncrasy to barbiturates is said to occur in 3 per cent of people, and toxic effects may arise from the administration of quite small doses. These may take many curious forms, a few of the commonest being:—

- (1) In the skin. (a) Urticarial weals. (b) Bullae. (c) Morbilliform or scarlatiniform maculo-papular erythema. (2) Alimentary. (a) Anorexia. (b) Nausea. (c) Epigastric pain. (d) Diarrhoea. (3) Nervous. (a) Defects of attention and memory, hence their use as basal narcotics, and hence, also, their danger if patients are administering the doses themselves. (b) Lassitude, fatigue and backache. (c) Confusion,

delusions and hallucinations. (d) Diplopia, nystagmus, ataxia and even coma. (4) Most barbiturates are cardiac depressants of more or less serious nature, and all cause some fall of blood pressure.

An interesting recent development is that by joining the barbiturate radicle to a metallic base, instead of to sodium, its toxicity and depressant action is diminished. *Calcium phanodorm* has been made, and more of such compounds will be produced in the near future. This detoxicating effect is not limited to this group of drugs. *Calcium aspirin*, for instance, is said to be less toxic, though no less analgesic, than plain aspirin.

In spite of severe criticism of their administration the malonylureas have established themselves as useful and reliable hypnotics, as reasonably safe as most potent medicines if wisely used, and out of the controversy that has raged around them certain rules for their administration have emerged:—

- (1) Obese or debilitated patients or those with liver or kidney disease tolerate them badly. (2) Patients with arteriosclerosis, myocardial disease or very low blood-pressure react badly to the shorter acting drugs. (3) Never repeat, for hypnotic purposes, a dose of a barbiturate. (4) Never mix barbiturates. (5) Never give them before, with, or after an opiate. To which excellent rule there is an equally excellent exception, namely, that *medinal* and *nembutal* go very well together. (6) They are better not prescribed in tablet form but in a cachet, as a powder, or best of all in solution. Substitution or reduction of the dose is then possible, which it may not be if the patient has become habituated to a trade-marked tablet.

#### MIXTURES

Hypnotic drugs are good examples of synergism and for this reason many blendings of them have become traditional, such as pot. brom. and chloral, and all practitioners discover favourite mixtures of their own. In their search for a sleep-producing drug, with pain-relieving qualities, which is not an opium-derivative, the drug houses have put many proprietary preparations on the market which are mixtures, usually in tablet form. *Allonal*, *cibalgin*, *veramon* are examples of a few. Most of them are mixtures of amidopyrin plus a barbiturate, despite the fact that recent work has demonstrated the danger of amidopyrin. There is usually too little analgesic in one tablet and too much barbiturate in two; it is better therefore, if desired, to use such a preparation to prescribe a personally-tested mixture of analgesic and hypnotic.

In the fact that the form in which they are given and that the time of their administration may effect their action, the hypnotics are no exception to other drugs. Solution accelerates their action as does administration at a time when the stomach is empty. It is common to hear patients complain that a preparation upon which reliance can be placed has failed to act when in reality what has happened is that it was taken immediately after a late and heavy meal. For similar reasons if the drug is given in a solid form, particularly as a tablet, the patient should be instructed to take a good draught of water, and not merely sufficient to wash it down.

#### Asthma: Immunological Mechanism, Diagnosis, and Treatment, with Special Reference to Vaccine Therapy

By D. HARLEY, B.Sc., M.B.

(From the *Lancet*, Vol. II, 15th August, 1936, p. 367)

It is generally accepted that the asthma syndrome is an expression of a state of abnormal sensitivity or increased reaction (allergy) of the body to certain foreign substances, most of which are quite harmless to normal individuals. To take an extreme case; reclining in an arm-chair padded with horsehair causes an attack of asthma in a 'horse-sensitive' asthmatic;



pricking the patient's skin with a needle which has been dipped in an extract of horsehair produces a violent local reaction; the injection of minute amounts of the extract causes severe asthma; the intravenous injection of a few minims of horse serum in such a case has been known to kill.

The evolution of the asthmatic state can be divided into three parts:—

1. *Predisposition* of the individual to become hypersensitive. This is commonly inherited but may be acquired. The exact nature of this immunological or biochemical kink is unknown.

2. *Development of hypersensitivity* to one or more of a wide variety of foreign substances. Contact with the offending substances then results in the violent reactions characteristic of the hypersensitive state. Though hypersensitiveness is developed commonly to substances with which the person came into close and repeated contact before the commencement of the asthma, this is by no means a constant feature and the capriciousness of the selection of sensitizing substances is well known. When the hypersensitive state is first developed the specificity of the reactions is usually very definite, the horse-sensitive asthmatic reacting to the hair and dandruff of horses but not to that of dogs or cattle. More commonly the sensitivity is multiple but specificity is still a prominent feature. After a time the asthmatic tends to have his attacks precipitated by one or more of a wide variety of non-specific factors unrelated to the primary exciting cause.

3. *Secondary non-specific factors*.—These include nearly all possible forms of minor trauma—toxic and psychic, direct and reflex, dietetic indiscretions, etc. It has been suggested that these act by lowering the 'tolerance' of the asthmatic to the primary specific exciting causes, so enabling the latter to provoke an attack in even more minute amounts than usually required.

#### IMMUNOLOGICAL MECHANISM

(a) *Hypersensitivity to non-bacterial products*.—These include inhalants (animal dandruffs, pollens, face powder, house dust, feathers) acting directly on the lungs, and ingested and injected substances (foods, drugs, sera) which reach the lung tissue *via* the blood stream. The active principles in these substances are variously designated *idiotoxins* (Freeman), *allergens*, and *atopens*. When the specific idiotoxins are brought into contact with the tissues of the asthmatic the characteristic reactions of the hypersensitive state are produced; the pathological basis of these reactions is spasm of smooth muscle and increased permeability of blood capillaries; thus urticaria is produced in the skin (this is utilized in the well-known diagnostic skin tests), asthma in the lungs, paroxysmal rhinorrhœa in the nose, etc. The injection of hypersensitive serum into the skin of a normal individual renders the latter hypersensitive locally so that subsequent contact with the specific idiotoxin results in the formation of an urticarial weal. When such a passively sensitized area of skin is acted upon by the specific idiotoxin, in sufficient quantity to elicit the maximum reaction, the site becomes desensitized—*i.e.*, does not react to further treatment with idiotoxin. Passive transfer of sensitivity is due to the presence in the sensitizing serum of special antibodies, the *atopic reagins*, *allergins*, or, more fittingly, *idioceptors*. When idioceptor is attached to the tissue cells the latter are rendered hypersensitive. The desensitization of patients by repeated injections of suitable doses of specific idiotoxin is the result of inactivation of idioceptor as shown by the abolition of the skin sensitivity.

(b) *Hypersensitivity to bacteria and their products*.—One is impressed by the large number of asthmatics presenting themselves for investigation and treatment in whom the asthma first appeared after or is associated with some infective process, often comparatively mild infections of the respiratory tract. Many of these

cases give negative or only very feeble skin reactions to inhalant and ingestant idiotoxins but bacteriological examination almost always reveals marked qualitative or quantitative abnormalities. The excellent results of vaccine therapy in these cases support the hypothesis that the relationship between the bacteria and the asthma is one of cause and effect. Such hypersensitivity to bacteria however is of a different character to the hypersensitivity to non-bacterial substances discussed above. In the latter skin reactions are of the immediate type, consisting of an urticarial weal with erythema, fully developed in 15 minutes or less, and passive transfer of sensitivity by injection of serum can be regularly accomplished. Though immediate skin reactions to bacterial vaccines have been occasionally reported, the common type is a delayed reaction, essentially inflammatory in nature, which takes 24 hours or more to develop, and passive transfer by the injection of serum is not obtained.

Bacterial vaccine skin tests in the diagnosis and treatment of bacterial-sensitization-asthma have been widely used in recent years, especially by clinicians in America. The usual method is to prepare vaccines of the bacteria of the sputum, etc., and test the patient's skin reactions to them. Those which produce reactions are employed for therapeutic purposes. Unfortunately these vaccine skin tests have proved unsatisfactory as it has been found that non-asthmatic individuals often give similar reactions to the vaccines, and also that vaccines of the normal intestinal Gram-negative bacilli often cause bigger reactions in the skin of the asthmatic than do the infecting organisms from the sputum (Rackemann and Graham, Benson, etc.). Experimental investigations (Harley) indicate that the delayed skin reaction is due to an increased sensitivity of the skin cells to the somatic nucleoprotein of the intact bacteria. This type of hypersensitiveness, or allergy as it is commonly called, is produced regularly in man and animals by natural and experimental infections; for example, the convalescent pneumonia patient gives the delayed skin reaction to pneumococcal nucleoprotein (Tillett and Francis), and it is well known that the majority of normal individuals react in the same way to *B. coli* vaccine. The presence of such bacterial allergy in asthmatics therefore is not in itself conclusive evidence that the particular organism producing the biggest reaction is the one responsible for the asthma. At present we have to rely on the clinical history, the absence of skin reactions to non-bacterial idiotoxins, and the bacteriological examination, to guide us in the diagnosis and vaccine treatment of 'bacterial-sensitization-asthma'.

#### TYPES OF ASTHMA

Clinically, the two main types of asthma discussed above may occur separately or together, with varying predominance of one or other. The following classification is not claimed to be a complete one, but it serves as a guide to the treatment of asthma from the immunological standpoint:—

1. Hypersensitivity to non-bacterial substances.
2. Ditto, plus secondary infections or toxæmias.
3. Bacterial asthma.
4. Ditto, plus secondary non-bacterial sensitizations.

*Type 1*.—The sensitivities may be single or multiple. Single sensitizations are rather uncommon and the diagnosis is usually readily established from the history and skin tests. Multiple sensitivity is the general rule, though one sensitization may predominate clinically. As the type becomes chronic the sensitivities tend to become more multiple and less distinct, and the constant trauma to the mucous membrane of the respiratory tract encourages the entry of infections to complicate the picture (*type 2*). Alternatively, an infection may convert a subclinical sensitization into an actual one, by lowering the tolerance of the mucous membrane to the specific idiotoxins. The same effect may also take place indirectly—*e.g.*, toxins from a distant focus of infection reaching the lungs *via* the blood stream.



**Type 3.**—The asthma results from an infection of the respiratory tract. In the case of nasopharyngeal infections, etc., the asthma is often 'reflex'. The history, bacteriological findings, and the absence of skin reactions to non-bacterial substances establish the diagnosis. The lowering of the vitality of the mucous membrane by the infection may encourage the development of minor degrees of sensitivity to non-bacterial substances of the inhalant type, usually resulting in multiple weak skin reactions (*type 4*). Bacteriological examination reveals the primary cause.

#### IMMUNOLOGICAL INVESTIGATION OF ASTHMA PATIENTS

**Skin tests.**—The method of testing employed at the St. Mary's Hospital asthma clinic is the 'prick' method (Freeman; Harley).

A drop of the extract to be tested is placed on the skin of the forearm or thigh and the latter lightly pricked once with a hypodermic needle through the drop at right angles to the surface. The drop is then gently wiped off with a pledget of cotton-wool. A positive reaction consists of an urticarial weal with surrounding erythema about the site of the puncture, and is fully developed in 10 to 15 minutes. Control tests are performed with normal carbol-saline. Though much stronger extracts are necessary to elicit reactions by the prick than by the intradermal and scratch methods of skin testing, the prick technique is more exact, and as the amount of trauma inflicted on the skin is much less with this method, doubtful and pseudo-reactions are less frequent.

The rapidity and accuracy with which a patient can be tested with a considerable number of extracts make the prick test the best routine method for the clinic.

**Bacteriological examination.**—This includes (a) routine blood-agar plate cultures of swabs of tonsils, nasopharynx, and sputum; (b) special examination of faeces, urine, cervix, and other possible foci of infection, if there is any suggestion of an underlying toxæmia, as in cases with feeble skin reactions and normal respiratory tract flora. Tellurite media and anaerobic cultures of the faeces are frequently valuable for the isolation of pathogenic streptococci. In the absence of any obvious pathogens, auto-hæmocultures (pathogen-selective-cultures), which utilize the *in vitro* bactericidal action of the patient's own blood on organisms to which he is immune and allow the growth of pathogenic organisms, often indicate the source of the trouble. Subcultures are made of the predominating pathogenic organisms for vaccine preparation.

#### TREATMENT

We are not concerned here with the palliative or symptomatic treatment of asthma, the correction of the 'secondary non-specific factors' discussed at the beginning of this paper, or the surgical aspects of focal sepsis, but rather with the treatment of the underlying cause from the immunological standpoint. The success of this type of therapy depends on the accurate diagnosis of the type of immunological mechanism involved in the individual case.

**Type 1 cases.**—If the sensitivity is to a single substance or to a small number of substances which can be removed readily from the patient's surroundings or diet, *specific avoidance* gives excellent results. Specific desensitization is indicated if specific avoidance is impossible or impracticable; the results in selected cases are highly satisfactory.

**Type 2 cases,** with multiple sensitivities and infections or toxæmias, usually respond best to vaccine therapy, with or without the above measures.

**Types 3 and 4.**—The rational treatment is vaccine therapy. Whether a stock or autogenous vaccine is employed, the commencing dose should not be more than 1 million organisms subcutaneously. The dose is repeated at 5- to 7-day intervals, and is cautiously increased till satisfactory results are obtained. After a few months of weekly injections, the interval between doses is gradually increased to one month. The optimal dosage and the length of treatment

required vary greatly, but it is usually advisable to repeat the maximum dose at monthly intervals for at least six months to a year. When there is evidence of chronic bronchitis or frequent winter colds a short course of prophylactic injections each autumn is recommended.

#### CONCLUSION

The tendency of the advanced allergist to consider all asthmatics in terms of skin reactions to non-bacterial substances, and to institute treatment accordingly, produces brilliant cures in certain cases (*type 1*), but leads to disappointing results where the primary cause is bacterial. I feel this is due partly to the use of the intradermal method of skin testing which frequently produces 'false positive' reactions (that are liable to be misinterpreted by the enthusiast) in the absence of the corresponding *clinical* sensitivities, and to the failure to make a routine bacteriological examination of all patients in whom the skin reactions are multiple and indistinct.

#### Nutrition in Health and Disease

By SIR ROBERT McCARRISON, C.I.E., M.D., D.S.C.,  
LL.D., F.R.C.P. (Oxford)

MAJOR-GENERAL, I.M.S. (Retd.)

(From the *British Medical Journal*, Vol. II,  
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THIS is an historic occasion. The inauguration of the *Section of Nutrition* is the recognition by the Association that the science of nutrition is an integral part of medicine. Last among the sections, it is not the least; indeed, the day is not far distant when, instead of one morning being devoted to its work, it will rank with the section of medicine as a three-day fixture. For with the rapid increase in knowledge it becomes more and more apparent that the science of nutrition is the foundation of a more rational medicine. It is to be hoped that on future occasions the work of this section will not be limited to physiological, biochemical, pathological, and medical aspects of the subject, but that it will include those that are veterinary and agricultural.

Although young in years the newer knowledge of nutrition has already established contacts with, indeed embraces in its compass, every branch of our profession. It may, therefore, serve as a fitting introduction to to-day's discussion to indicate, though without aiming at completeness, what these contacts are; taking the nineteen other sections, into which the clinical and scientific work of the annual meeting is divided, as the basis of this survey.

First, then, in regard to *Medicine*, which heads the list of the sections, and with which *Public Medicine* and *Diseases of Children* may be included. What contacts has the science of nutrition established with medicine? This question can best be answered by defining 'medicine' and by defining 'nutrition'. For the first definition we may look to a lay, or non-professional, dictionary to find what the public expects of medicine. There it is defined as 'the science or art of the prevention, treatment, and cure of disease'; not merely 'any substance given for the cure of disease'; not merely 'the science of the treatment of disease'; not merely 'that branch of the healing art dealing with internal disease'. It is significant that in this definition prevention takes precedence of treatment and cure. Medicine is, in short, the science and art of maintaining health.

#### DEFINITION

And what is 'nutrition'? It is a fundamental function on which the condition of the body—that is to say, health—depends. It is not merely 'food' nor 'that which nourishes', as some lay dictionaries define it. Food is the instrument of nourishment; nutrition is the act of using it—the series of co-ordinated processes whereby the nourishment of the body is effected. It consists in the taking-in and assimilation through

chemical changes—metabolism—of materials with which the tissues of the body are built up, their waste repaired, and their deterioration prevented; by which the processes of the body are regulated and co-ordinated, from which energy is liberated for the internal and external work of the body, and from which heat is generated for the maintenance of its temperature. A primary purpose of the function of nutrition is, thus, to establish and to sustain the structure and function of all organs and parts of the body: to keep, in short, the mechanism of the body in perfect running order. And since health, at its best—for it is a variable state of being—is that condition of body in which all its organs and parts are sound and perform their functions duly, easily, and satisfactorily, it follows that a primary purpose of the function of nutrition is to prevent, so far as its limitations permit, that disturbance or impairment of structure or function of organs or parts of the body which is disease. This, then, is the relation of nutrition to health and disease—the subject of our discussion to-day—the answer to the question: What contacts has nutrition established with medicine?

The older knowledge of nutrition showed the fundamental relations of the energy-yielding constituents of food to vital activities. It showed, also, the importance of the protein factor in nutrition. But it is only within recent years that the equally important relations of certain food-essentials—notably, mineral elements and vitamins—to the structural and functional efficiency of the mechanism of the body have received their due meed of attention. The study of these relations has led to a new conception of causes and origins of disease: a conception which may be summed up in the sequence—faulty food, faulty nutrition, faulty function, faulty structure, faulty health—disease. It is with this newer knowledge of nutrition, and not with the energy requirements of the body, that we are concerned to-day.

#### FACTORS AFFECTING NUTRITION

Nutrition, as we all know, depends on a number of factors: the constitution of the food, the adequate oxygenation of the blood and tissues, the efficiency of the processes—digestion, absorption, assimilation, circulation, excretion—involved in this function, proper exercise of the body, rest and sleep, freedom from worry and emotional excitement, general hygiene, sunlight, and inherited characters. Chief among these is food of a constitution that provides all the elements and complexes needed for normal nutrition. Moreover, the lack or insufficient supply of one or more of these essentials, or their disproportion one to another, may be the determining cause of some of the other factors that adversely affect the function of nutrition, thus creating a vicious circle. Imperfect oxygenation of the blood and tissues may, for instance, be the outcome of specific food faults. Restlessness and excitement may be consequences of faulty feeding. Food of improper constitution may be the cause of impairment of any of the processes involved in nutrition. Defects in diet may enhance the harmful effects of want of sunlight. Food is thus the greatest of all factors on which the efficiency of the function of nutrition depends. It is the foundation of health; chief amongst the armaments of medicine against disease. 'There may', as Holt aptly expresses it, 'be normal nutrition without normal health, but there cannot be normal health without normal nutrition'.

Here the question arises: what are the materials wherewith the function of nutrition is effected and whence are they derived? They are, so far as is at present known, oxygen, water, and the digestion products of proteins—fats, carbohydrates, mineral elements, and vitamins. There may be others, probably there are. So we are on surer ground when we consider the foodstuffs which, when properly combined in the diet, are known to ensure perfect nutrition and a high grade of physical efficiency and health in human beings. These foodstuffs are: (1) A good whole cereal grain or mixture of whole cereal grains or a good wholemeal bread. (2) Milk and the products of milk—butter, cheese,

curds, buttermilk. (3) Egg. (4) Green leaf vegetables. (5) Root . . . . .ts, etc. (6) Legumes. (7) Fru . . . . . That these provide all elements and complexes, known and unknown, needed for normal nutrition is evident from the fact that they are the ingredients of the national diets of certain races of northern India whose physique and health, when they make use of their national diets in their entirety, are unsurpassed by any other race of mankind. Further, albino rats, when fed on a diet made up of these ingredients, can be maintained in perfect health. Most of these foodstuffs are nowadays classed as 'protective foods'—a discovery made centuries ago by the races referred to, and of which the newer knowledge of nutrition has revealed the importance. If food be the foundation of health, these foodstuffs are its foundation-stones. Using them aright there is little need to concern ourselves too closely with the precise amounts of this or that chemical ingredient of food that may be necessary for normal nutrition. These foodstuffs provide them all and in due amount and proportion one to another. There is, however, this proviso, that they must be produced on soils which are not themselves depleted of essential plant nutrients or of substances, such as iodine, needed for the normal nutrition of man and animals and conveyed to them by plants. 'Les plantes sont les enfants de la terre, de l'air, et du soleil'; and we, in common with other animals, are the offspring of the plants.

Here it may be remarked that important as properly constituted food is at every period of life, it is at no period so important as during infancy and childhood; for then it is that the body is being built, then that defects in its structure and efficiency are so readily established, defects that are at the root of many of the diseases to which man is erroneously supposed to be heir.

#### BACTERIOLOGY AND PATHOLOGY

So much, then, for Medicine; now as to the contacts of nutrition with bacteriology and pathology. First, as regards the relation of nutrition to resistance to infection. Long long ago, Clausen submitted the available evidence on this question to critical analysis. His general conclusions were as follows:—

'Resistance to infection may be greatly reduced by deficient diet. A deficiency in the diet of vitamin A or of vitamin C appears quite definitely to lower resistance to infection. In certain cases a lack of the vitamin-B complex may also do the same thing. A lack of vitamin D (*per se*) cannot be said to have a proven effect in lowering resistance (such lowering when it occurs is usually due to associated deficiency of vitamin A). It seems probable that the existence of a partial deficiency (of vitamins) may result in loss of resistance to infection. . . . .'

Under 'deficient diet', as mentioned in these conclusions, there are to be included deficiency of protein and deficiency of certain mineral elements, notably calcium.

The contacts of nutrition with pathology may best be illustrated by the effects of faulty nutrition on the digestive and endocrine systems: the former a highly specialized mechanism designed for the nourishment of the body; the latter a highly specialized mechanism designed for the control and co-ordination of the round of chemical changes (metabolism) on which nutrition depends.

#### GASTRO-INTESTINAL TRACT

The discovery of the effects of deficient and ill-balanced food on the gastro-intestinal tract is 'one of the most significant . . . the rôle of nutrition in preventive . . . discovery was made by feeding monkeys on diets having a number of faults—poverty of vitamins and mineral elements and excessive richness in carbohydrates: faults common in human dietaries. 'Deficient foods are in practice usually ill-balanced foods, and the effects of avitaminosis are bound up with maladjustments both in quality and quantity of other essential requisites of the food'. The health of the gastro-intestinal tract depends

on the adequate provision in the diet of water, proteins, mineral elements, and vitamins. It is unnecessary to enlarge on the functions of water relative to digestive processes. In regard to proteins it is enough to say that they and their contained amino-acids are the source from which hydrolytic enzymes concerned in digestion are derived and from which catalytic agents (glutathione, thyroxine, adrenaline, and insulin) are elaborated. As to mineral elements it needs but to recall that they enter into the composition of all cells, including those of this tract, that they control the permeability of cell membranes, the normal contractility of muscles, and the excitability of nerves, including those of this tract, and, that some enter into the composition of the digestive juices. Their adequate provision is therefore of the first importance to the efficient performance of the functions of the stomach and intestines. Vitamins of the A, B, and C classes have all a profound relation to the structural and functional efficiency of the alimentary tract. Witness the effect of deficiency of vitamin B<sub>1</sub> in impairing the motility of the stomach, with consequent loss of appetite. Witness its effect in impairing gastric secretion and the normal rate of passage of the intestinal residues. Witness the effects of deficiency of vitamin B<sub>2</sub> on the health of the lining membrane of the tract. Witness that of vitamin-A deficiency in favouring infection of it, an effect which it shares in common with deficiency of vitamin-C and of the vitamin-B complex. Witness the congestive, hæmorrhagic and ulcerative lesions produced in it by vitamin-C deficiency. Witness the experimental production by these means in animals of such lesions as gastric dilatation, gastritis, peptic ulcer, enteritis, and colitis. Witness the incidence of gastrointestinal disease, amounting to 25 per cent of all ailments, amongst insured persons in this country whose diets have so often faults of this character.

#### DIET AND ENDOCRINES

Consider the effects of faulty food on the endocrine glands: the sensitivity of the adrenals to deficiency of vitamins B and C; the sensitivity of the thyroid to deficiency of iodine, of certain vitamins, and of protein, and its reaction to certain excesses in the food, as of fats and calcium; the atrophic changes in the pancreas brought about by carbohydrate-rich and vitamin-poor diets; the functional impairment of the reproductive due to certain food deficiencies. Food deficiencies, as I pointed out many years ago, derange both the normal production of hormones and the functional perfection of sympathetic nervous control. Consequently, organs such as those of the digestive system are deprived of the full advantage of that efficient regulation and correlation which normally they would derive from healthy endocrine action. Fifteen years ago I wrote as follows: 'Especially do I direct attention to the effects of food deficiency on the digestive organs and on those endocrine organs concerned in the regulation of metabolic processes. These effects provide the pathological basis for attaching to food deficiencies a prominent ætiological significance in regard to that great mass of ill-defined gastro-intestinal disorders and vague ill-health which throngs clinics at the present day, and concerning which we have hitherto known little or nothing'. I repeat this passage with the greater emphasis to-day, since the intervening years have provided abundant confirmation of its truth.

#### OBSTETRICS AND GYNÆCOLOGY

Contacts of nutrition with obstetrics and gynæcology are many. It will suffice to mention some of them: the impediments which the effects of rickets and osteomalacia may present to parturition; the relations of food, in particular of fats, mineral elements, and vitamins, to fertility, pregnancy, and lactation; the rôle of linoleic acid (sometimes called vitamin F) in favouring fertility; the probable effect of fat in facilitating the transference of vitamin A through the placenta to the fœtus; the need for an abundant supply of

vitamins A, B, and C and of calcium, phosphorus, magnesium, and iron to pregnant and lactating women, and their need for adequate supplies of vitamins D and E and of iodine; the rôle of vitamin E in preventing habitual abortion; the effects of vitamin-A deficiency on the reproductive tract—vaginal cornification, prolonged gestation, difficult parturition, uterine bleeding, variations in size of the placenta, tissue necrosis of the uterine wall—effects which in their turn may favour endogenous or exogenous infection. It is true that these effects have so far been observed only in rats, but is well within the bounds of possibility that they may result in women from similar dietetic causes. It is significant that they occur in rats kept at levels of vitamin-A deficiency insufficient to cause xerophthalmia. All these observations indicate the necessity for the proper feeding of prospective mothers, and of pregnant and nursing women: a necessity as much in the interests of the child as of the mother.

#### SURGERY AND ANATOMY

In regard to surgery little need be said except that the need for it will lessen, certainly in the treatment of internal diseases, when the people learn to feed themselves properly and have the means to do so, and when the profession learns to lead them along the healthful ways of nutrition. The triumphs of surgery—and who would wish to minimize them?—are often the defeats of medicine. But as surgery was resuscitated, not so very long ago, by the application of the principles of antiseptics, so will medicine, now so dependent on surgery, be resuscitated by the application of the principles of nutrition. The relation of nutrition to surgical results, to the healing of wounds, to the mending of fractures, and to chronic bone and joint diseases needs no emphasis.

Coming now to anatomy: what relation has nutrition to this? Clearly an important one, especially in regard to the minute structure of the tissues of the body. 'For however necessary a knowledge of normal structure of organs and parts of the body may be, it is not less necessary to possess a knowledge of the structural changes induced in them by so fundamental a factor as faulty food'.

#### PHYSIOLOGY

Physiology and biochemistry are so closely interwoven with the science of nutrition that they may be said to be departments of it. Their contacts with it are obvious. To biochemistry has fallen the task of isolating the vitamins; a task it is fulfilling with conspicuous success. There is, however, the risk that in the maze of vitamin and biochemical literature the practitioner of medicine may lose sight of the simple fact that all that the body needs for perfect nutrition is provided in the relatively few foodstuffs already mentioned, if these be consumed in proper quantity and in the form in which nature provides them. Then the questions as to what vitamins, what minerals, what other substances, and how much of them are needed by the body are answered for him and more certainly than by biochemistry.

#### NOMENCLATURE

Here some reference may be made to the nomenclature of the vitamins. These are still spoken of as 'accessory food factors', as 'anti-this' or 'anti-that' deficiency. The time has come to disencumber them of these limiting descriptive terms. For they are not 'accessories' but essentials, in no way subordinate to the other principles of food. They are substances indispensable to nutrition at every stage in its processes from appetite and the ingestion of food to the evacuation from the body of its waste products; substances without a sufficiency of which normal structure and normal function of organs or parts of the body cannot be maintained; substances as essential to the mechanism of the body as oil is to the mechanism of the car. It is true that they oppose the occurrence of this or that 'deficiency disease'—a term that has also outgrown its usefulness—but they have, as I pointed out many

years ago, much else to do besides the prevention of these maladies, and this much else is their greater function. The main objection to the continued use of these terms is the impression they convey that because there is no xerophthalmia there can be no vitamin-A insufficiency, or because there is no beri-beri there can be no vitamin-B insufficiency, and so on through the list of 'antis'. It is the insufficiency, the inadequate ingestion, absorption, or utilization of the vitamins rather than their complete absence from the diet (an exceedingly rare event, even in the case of beri-beri) that is of such importance in the practice of medicine. These terms were well enough as props to a dawning understanding of the rôle of the vitamins in nutrition. But now that the edifice of knowledge has come to rest on a sure foundation these props are no longer needed.

#### PSYCHOLOGY AND NEUROLOGY

Nutrition has a close concern for psychological medicine and neurology.

'The rapid growth of the brain and the development of the nervous system render the growing child peculiarly susceptible to nervous disturbances, whenever conditions of life are such as to interfere with normal nutrition. Most of the neuroses of childhood depend entirely upon disorders of nutrition. The headaches, insomnia, disturbed sleep, chorea, habit-spasm, hysterical manifestations and a multitude of others are relieved only by correcting the faulty diet and habits which are the basis of the disturbed nutrition'.—Holt.

The relation of nutrition to intelligence and backwardness in schoolchildren, the mental disorders in pellagra, the interdependence of physical and mental conditions are other examples of the contacts of nutrition with psychological medicine.

It is now definitely known that deficiency of vitamins A, B<sub>1</sub>, and B<sub>2</sub> has important relations to the development and health of the nervous system. A striking example of this truth is that afforded by the tissue-culture work carried out at the Nutrition Research Laboratories, Coonoor. There it was found that embryonic nerve tissue failed to grow normally in the plasma of animals deprived either of vitamin A or of vitamin B. Among the effects on the nervous system of vitamin deficiencies are non-inflammatory peripheral neuritis, degenerative changes in the brachial plexus, sciatic nerves, sensory tracts in the periphery of the spinal cord, posterior columns and posterior nerve roots, Gasserian ganglion, and less commonly in anterior nerve roots and vagus. The nerve changes often present in pellagra in man, as well as the association of vitamin-B<sub>2</sub> deficiency with beri-beri, with some cases of neuritis in pregnancy and, possibly, with alcoholic neuritis, are familiar examples of the contacts of nutrition with neurology.

In the field of ophthalmology the relation of night-blindness—of which there appear to be minor degrees more common in Western countries than was formerly supposed—xerophthalmia, and keratomalacia, to deficiency of vitamin A, is now well established. In connection with it, it may be recalled that the changes brought about by it in the conjunctiva appear to confer pathogenic characters upon otherwise harmless saprophytes present thereon; changes in the soil seem to alter the characters of the seed.

#### ORTHOPÆDICS AND RADIOLOGY

Orthopædics has contacts with nutritions that are exemplified in the results of rickets and osteomalacia. The fragility of bones, spinal curvature, displacement of vertebrae, diseases of joints, slow and imperfect mending of fractures, all caused, or possibly caused, by faulty nutrition, are other examples of these contacts. Here mention may be made of a case of spondylolisthesis, in a child of well-to-do parents, that lately came to my notice: an example, as it proved to be, of malnutrition in the midst of plenty and of the truth that it is not the food presented to a child but the food eaten and utilized that is of importance. In this case operation by bone-grafting was suggested for the

correction of the deformity: a suggestion fortunately not followed; for the child made a complete recovery, as evidenced by an x-ray examination, after a year's proper feeding combined with properly directed exercises.

It is in such cases as this and in the detection of rachitic and other bony changes which might otherwise escape observation that radiology comes into touch with nutrition. Physical medicine does not, at present, appear to have any direct contacts with nutrition, yet the use of physical methods in endocrine disorders and in certain maladies that may have a malnutrition basis may not be without significance.

#### OTORHINOLARYNGOLOGY

Nutrition has a close concern for otorhinolaryngology, particularly in view of the changes brought about in mucous membranes by deficiency of vitamin A. These changes, which I shall have the opportunity to demonstrate to you this afternoon, are such as break down the local defences against infection, and may be of localized or widespread distribution. It is common knowledge that malnourished, weakly, and ill-conditioned children are peculiarly susceptible to inflammatory states of the nose, ear and throat. 'It is almost impossible in winter to keep such children in a hospital ward more than a week or two without their developing rhinopharyngitis, otitis, bronchitis or bronchopneumonia' (Holt): a state of affairs recalling the 'hospitalism' of the dark days of surgery prior to the advent of Lister. Such children frequently suffer from adenoids, which may possibly have a malnutritional basis, for I have myself observed the development of adenoid-like outgrowths in the upper respiratory passages of improperly fed rats.

#### TUBERCULOSIS AND DERMATOLOGY

Concerning tuberculosis and nutrition, one example will suffice: at the Papworth Village Settlement no child born there during the twenty years of its existence has, while a member of the community, contracted tuberculosis of the lungs, bones, joints, cerebral membranes, nor indeed any clinical form of the disease. Yet these children are the offspring of parents who suffer from tuberculosis and are in constant contact with them. How has this remarkable achievement been brought about? (1) By adequate nutrition, which maintains the child's resistance to infection, and (2) by the absence of mass dose infection—procedures which will prevent many other diseases besides tuberculosis. Here it is necessary to emphasize the relation of faulty nutrition to respiratory disease in general. It is a significant fact that one out of every ten sick persons amongst the insured classes in England and Wales suffers from such disease, and that rats fed on a diet in common use by these persons frequently develop such disease. Deficiency of vitamin A is particularly concerned in bringing this about.

In the domain of dermatology the effects of faulty nutrition on the skin are well recognized; semi-starvation, water deficiency, protein deficiency, mineral deficiency (particularly of iron, calcium, phosphorus, and iodine) and vitamin deficiency (particularly of vitamins A, B, and C) all have harmful effects on this organ and its appendages. Amongst them are dry and inelastic skin, roughening, atrophy, laxness, wrinkling, slow growth of hair, staring hair, loss of hair, slow healing of skin wounds, poor and imperfect cicatrices, furunculosis, ulcers, exudative skin diseases such as eczema and seborrhoea, the skin lesions of pellagra, oedema, xerosis, abscesses, inflammatory conditions at mucocutaneous junctions, the papular condition known as 'phrenoderma', hyperkeratosis, petechial hæmorrhages and other scorbutic skin affections.

#### THERAPEUTICS

It is in the domain of therapeutics that the newer knowledge of nutrition finds scope for practical application. 'Formerly, in planning the patient's food,

physicians thought solely in terms of the local pathological condition, of the harm they might do some impaired organ; now they think chiefly in terms of general physiology, of the good they can do the patient as a whole. It is in most cases the patient who must be treated rather than the disease from which he suffers, and in this treatment nothing is so important as maintaining nutrition. Witness the changes that have come about within recent years in the treatment of such conditions as typhoid fever, gastric ulcer, Bright's disease, hypertension, diabetes, tuberculosis, chronic arthritis, and eclampsia: a change based on the fundamental principles of the correction of food faults and the provision in proper amounts and proportions one to another of the various food-essentials needed for the maintenance of structure and function of organs or parts of the body. In the last resort the patient must, with remarkably few exceptions, heal himself, and it is by adequate nutrition that he can best be put in the way of doing so. Here the newer knowledge comes to the aid of the physician, enabling him, by means of refined preparations, rapidly to satisfy the needs of the body for substances that are in default, and thus to hasten cure.

#### MEDICAL SOCIOLOGY

The importance of nutrition in medical sociology is evidenced by the programme of work before that section at the present annual meeting, wherein it is given a prominent place; it will, then, speak for itself. But I am constrained in this connection to refer again to the remarkable experiences the late Miss Margaret McMillan mentioned in her book—*The Nursery School* (1930). Here she has described the weakly, ill-nourished, and ill-conditioned children of the slums who come for admission to the nursery school at Deptford: children who are rachitic and bronchitic; children with inflammatory states of the nose, ear and throat; children who have adenoids and dental caries. After they have been nurtured and properly fed for a few years they are, she says, almost all cured of any ailments from which they may have suffered on their entrance to the school. They are all straight and well grown, the average child is well made with a clean skin, is alert, sociable, and eager for life and new

experience..... 'He does not need to see the doctor or the dentist, and he has none of the minor ailments which affect the children of the slums'. Surely, we have in experiences such as this the root of the whole matter. We now know that large numbers of our people have not the means wherewith to provide themselves with proper food even though they had the knowledge to enable them to judge of what is proper; a state of affairs damnatory of our civilization. But it would be wrong to suppose that poverty is the only cause of faulty nutrition. 'Access to abundance of food does not necessarily protect from the effects of food deficiency, since a number of factors—penury, prejudice, ignorance, habit—often prevents the proper use and choice of health-giving foods'. To these impediments to normal nutrition I would add indifference, neglect, and the weak indulgence of their children by many well-to-do parents who foster tastes and habits detrimental to normal growth, nutrition, and health. Education of the people, the better education of ourselves: these are urgent necessities. It may be that the medical curriculum is already overgrown. If so, let it be pruned, let us teach the student less about 'disease' and drugs and more about 'health', more about nutrition, which is the very basis of health.

#### MEDICAL HISTORY

I come now to the last of the sections—that of the history of medicine. In this history no chapter is more romantic, more inspiring, more replete with hope for the future of our calling and for the well-being of mankind than that dealing with the newer knowledge of nutrition. Its opening pages tell of the dawning idea of the relation of certain diseases, notably scurvy and beri-beri, to defects in food. These are succeeded by others describing the discovery of vitamins. As the story unfolds the numbers of these and of other elements and complexes, found to be necessary for normal nutrition, increase, and the conception of disease as a manifestation of disturbed structure or functions of the body consequent on faulty feeding and on the faulty nutrition resulting therefrom comes into being. Patient research, the discovery of facts, generalizations from facts, the prediction of fresh facts—its pages tell of these. These are the ways of science; these the ways in which the science of nutrition has been built up.

## Reviews

**THE QUEEN CHARLOTTE'S TEXTBOOK OF OBSTETRICS.**—By Members of the Clinical Staff of the Hospital. Fourth Edition. 1936. J. and A. Churchill Limited, London. Pp. xi plus 674, with 4 colour plates and 291 text-figures. Price, 18s.

A NEW edition of this standard textbook has been published three yearly since it first appeared in 1927. This bears witness to the high standard aimed at and attained by the writers of the book. The 1936 edition contains an important addition in the description of the results of the work on the ætiology of puerperal sepsis by Dr. Colebrook in the research laboratories of the Queen Charlotte's Hospital. The section on the toxæmias also has been brought up to date.

This book represents the teaching at Queen Charlotte's Hospital and is written by members of the clinical staff of the hospital. It differs little in the main from the teaching of obstetrics as practised in other London hospitals and it provides an excellent students' textbook of midwifery. It is clearly written and the

illustrations are good. The chapters on antenatal care and the normal and sick new-born babies are fuller than in many textbooks of midwifery. There is a valuable chapter on abdominal pain in pregnancy. The book is essentially practical and it is doubtful if a better introduction to the practice of midwifery could be found. The whole problem of mother and child, attendant and environment is kept in view throughout the book. It can be most thoroughly recommended.

M. N.

**A TEXTBOOK OF OBSTETRICS.**—By Edward A. Schumann, A.B., M.D., F.A.C.S. 1936. W. B. Saunders Company, Philadelphia and London. Pp. 780, with 581 illustrations on 497 figures. Price, 27s. 6d.

THIS American textbook strikes a British reader 'favorably' by reason of the illustrations which are many and good and have the value of appearing new



and better than the diagrams which one is accustomed to expect in textbooks of midwifery.

The book as a whole falls between the students' textbook and the more advanced works on obstetrics. A large section is devoted to development of the foetus and to obstetrical pathology. The management of pregnancy is given only a very short chapter and the new-born child is dismissed in two pages. One misses reference to the later work on the ætiology of puerperal sepsis but the subject of the toxæmias is discussed at great length.

There is a vast amount of information in this book, but it seems to be presented in a somewhat indiscriminate manner, likely to lead astray any but those with a sound knowledge of midwifery. The opinions expressed are those of an individual and some of them are certainly controversial. The description of the treatment of post-partum hæmorrhage in which the writer so confidently emphasizes the use of packing of the uterine cavity should be read only by the experienced. The teaching on the question of tuberculosis and pregnancy may be true of a country where institutional treatment of tuberculosis is easily obtainable, one doubts whether it could be more widely applied. It is surprising to read that puberty in India is reached at the age of eleven years and in Great Britain at fifteen years. The operation of forceps delivery should, in the opinion of the author, take an hour.

This book is stimulating reading because one so frequently encounters an opinion which seems open to question, but it can only be recommended to those in a position to apply the critical faculty.

M. N.

**A TREATISE ON MATERIA MEDICA AND THERAPEUTICS INCLUDING PHARMACY, DISPENSING, PHARMACOLOGY AND ADMINISTRATION OF DRUGS.**—By the late R. Ghosh. Fourteenth Edition by B. N. Ghosh, F.R.F.P. & S. (Glas.), 1936. Published by Hilton and Company, Calcutta. Pp. xv plus 724, with 13 illustrations. Price, Rs. 7-8 or 12s. 6d.

THE first edition of the 'Treatise on Materia Medica and Therapeutics' appeared in 1901, nearly 35 years ago. Since then the book has passed through fourteen editions and several reprints. This fact alone bears testimony to the wide range of usefulness and popularity of the book. It is gratifying to note that the present edition (fourteenth edition) under the able editorship of Professor B. N. Ghosh maintains the tradition and the high standard of excellence already set by its predecessors.

Though the original title of the book is retained and the binding and format are generally similar to the previous editions, the present edition is a completely new book from several points of view. The subject-matter has undergone considerable changes with the rapid growth of knowledge of pharmacology and therapeutics. Rational therapeutics is gradually replacing the empirical use of drugs and this tendency is reflected in the section on materia medica where the 'official' preparations are described in more detail and only the more important and commonly used non-official remedies mentioned. Part III deals with the pharmacology and therapeutics of drugs and, in this section, attempt has been made to incorporate the more recent developments in the subject. A few explanatory tracings are included in connection with some of the more important therapeutic agents, but the students would be happier to see more of these tracings. Modern teachers on pharmacology are tending to lay more stress on the subject of chemical constitution and pharmacological action of drugs. Recent advances in organic and synthetic chemistry have clarified many obscure points in this regard and it appears that, if this aspect were attended to more carefully, the teaching of pharmacology would be made simpler and more attractive. It is hoped that, in a future edition, the

author will consider giving added emphasis to this side of the question.

Of the many other useful features of the book, mention may be made of the chapter on serum and vaccine therapeutics and the section on Indian indigenous drugs.

We have nothing but praise for this edition and we hope that it will find a place in the library of every practitioner and medical student.

R. N. C.

**AN INTRODUCTION TO DERMATOLOGY: WITH A CHAPTER ON THE THEORY AND TECHNIQUE OF X-RAY AND RADIUM THERAPY.**—By E. H. Molesworth, M.D., Ch.M. (Sydney). 1937. J. and A. Churchill Limited, London. Pp. xviii plus 520 containing 151 illustrations in the text and references to the coloured plates of Jacobi's Dermochromes and Semon's Atlas of the Commoner Skin Diseases. Price, 25s.

IN the past few years there has been a considerable number of short books on dermatology and when the reviewer received this volume he wondered, before he opened it, if it would prove worth the effort of its production.

On going through it he was pleasantly surprised, for it is an essentially practical production that cannot fail to be of use to the beginner and general practitioner who only has occasional cases of skin disease to treat. The principal manner in which this book differs from similar short books on dermatology is that the author, instead of being content with saying, as most writers do, that so and so 'may be tried', 'has been found of use by some workers', etc., etc., gives the reader the benefit of his own vast experience and if he has found a certain line of treatment no use he does not hesitate to say so. This dogmatism will perhaps lead to criticism as one naturally does not find one's own experience to coincide completely with that of the author of the book. Nevertheless dogmatic treatment of a subject is an advantage in instructing a beginner who is thereby given a point of view from which he can commence to amass his own experience which may perhaps modify his early learning. On this ground this addition to the dermatological books of the British Empire is strongly recommended.

P. A. M.

**PAGET'S DISEASE OF THE NIPPLE AND ITS RELATION TO SURFACE CANCERS AND PRE-CANCEROUS STATES IN GENERAL.**—By Dr. Keith Inglis, M.D., Ch.M. (Sydney). 1936. Oxford University Press, London. Pp. 233 with 237 figures. Price, 30s.

THIS is a special work on the particular disease commonly known as Paget's disease of the nipple. As the author has observed in the preface, the book is the result of investigation regarding the morbid histology of Paget's disease. It is very pleasant indeed to observe that the investigation has been carried out in an excellent way and the distinguishing points regarding the nature of Paget's disease have been very clearly elucidated by splendid histological work. As the title of the book denotes, the subject has been studied very thoroughly and allied conditions which clinically appear to be Paget's disease have been included and differentiated from the conditions by histopathological evidence.

The subject has been presented in a scientific way and at the end of each chapter a summary of the discussions has been given. A distinguishing feature of the book is found in the concluding six pages in which the whole subject has been thoroughly discussed and the views of different authorities cited with reference to their respective literature. Lastly, the author's own views supported by unassailable histological evidence have been enunciated. Such a subject, we have no



hesitation in saying will be an useful addition to surgical pathology.

The whole book is comprehensive and very successful. Its get-up, illustrations (237 in a book of 233 pages) and above all the contents are uniformly satisfactory.

We have nothing but wholehearted praise of Professor Inglis's splendid investigations and his achievements. The only point to which we would like to draw his attention is that he has used the term 'cancer' throughout the text.

M. N. D.

**RURAL WELFARE IN INDIA IN 1936.**—By C. F. Strickland, C.I.E. Humphrey Milford, Oxford University Press. Pp. 54. Obtainable from Oxford University Press, Bombay, India. Price, As. 8.

MR. C. F. STRICKLAND has brought together in a convenient form the activities of the various organizations in India, governmental and other, which are actively helping the rural uplift movement in the country. The Government of India has made a sum of Rs. 3½ crores available to the provincial governments as grants to assist them in developing rural-welfare work. Some provinces such as Madras, Bengal, Bihar, Orissa and Assam are devoting the bulk of their grants to the improvement of water-supply, sanitation and rural roads. Bombay, the Central Provinces, the Punjab and the United Provinces have already had in progress various schemes for the amelioration of the condition of the agricultural population in the villages. The grants made by the Central Government have therefore helped to stimulate further the activities of these provinces.

Mr. Strickland has rightly drawn attention to four points which are essential if the rural welfare movement is to achieve success. The work of the various departments undertaking a share of the work should be co-ordinated and the necessity for linking together the official and non-official agencies should not be lost sight of, if overlapping and waste of effort are to be avoided. The employment of trained personnel is another important matter. They need not be experts in their own subjects, because experts can be called in whenever necessary. But the rural-welfare workers, men and women, should be trained to appreciate the villager's point of view and to win his confidence. Otherwise nothing can be achieved. A third criterion of success is that the cost should be kept down to the minimum. The fourth and perhaps the most important is that of permanence. The zealous servant of the government or the missionary may, through personal influence, bring about temporary improvements in village life, but lasting results can be achieved only through a change in the outlook of the people. All over the world the experience of reformers is that nothing lasting can be accomplished in less than a generation. The children have to grow up under the new conditions in order that the changes may be assimilated into the life of the people. It is therefore an essential condition for success that the governments and other agencies intent on developing rural welfare in India should be prepared to persevere with their schemes for a period of thirty years.

The work of the various provincial governments and of some of the Indian States has been briefly described, with helpful criticisms at each stage. Nor has Mr. Strickland lost sight of other agencies working in the same direction, such as the Red Cross Society and the Harijan Sewak Sabha under the guidance of Mr. Gandhi. The excellent work done by the Y. M. C. A. in several centres in the country deserves special mention.

Lastly, the questions of debt relief, consolidation of agricultural holdings, child marriage and broadcasting for the education of the rural population and for increasing their happiness have been briefly discussed.

The Indian Village Welfare Association, under whose auspices this small book was published, has been founded in Great Britain for the purpose of stimulating interest in the life of the rural population of India and two similar booklets have already been published for 1932 and 1934. The activities of the Association, which include periodical lectures by persons familiar with village conditions in this country as well as the organization of a 'school' every year at Easter time for persons proposing to undertake work in rural India, deserve commendation, especially when we remember that 89 per cent of the population live in the villages.

#### CONTRACEPTION AS A THERAPEUTIC MEASURE.—

By Bessie L. Moses, M.D. 1936. Baillière, Tindall and Cox, London. Pp. xiii plus 106. Price, 4s. 6d.

THIS book is a report on the medical aspects of the work of the Bureau for Contraceptive Advice which was opened in Baltimore in connection with the John Hopkins University in 1927.

The primary purpose of this bureau was to collect about 1,000 cases of women who required contraceptive advice on therapeutic grounds, to keep careful records for analysis and to obtain data as to the effectiveness of the methods of birth control advised. The patients were referred to the clinic by their own doctors on definite medical indications, and no propaganda was carried out. During the five years in which the bureau operated the data were collected and advice given by Dr. Moses herself with some assistance during the last two years from another woman physician. Careful follow-up work was done at the time of return visits to the clinic, and by letters and home visits if necessary.

One thousand one hundred and fifty-two patients were referred to the clinic, 944 white and 208 negro. The average age at the first visit to the clinic was 30 years and the average number of previous pregnancies was five.

65 per cent of the cases were sent for definite medical reasons of which more than a third was for systemic diseases—venereal diseases and obstetrical indications (such as previous Cæsarean section) and nervous and mental diseases accounted for the majority of other medical reasons. Amongst the other (not strictly medical reasons) were multiparity, indications in the husband, and eugenic reasons.

The method advised in nearly all cases was a vaginal occlusive diaphragm pessary and a spermicidal jelly. A soap and water douche to be used after removal of the pessary was also advised in most cases. The results of advice given were carefully analyzed according to race, intelligence of the patient, continued use of the method, and the occurrence of pregnancy. Approximately 45 per cent of the total number of treated cases attended the clinic and used the method successfully for periods of six months to six years.

Amongst the treated cases in which pregnancy occurred in only 2.7 per cent could this be shown to be due to failure of the method. In the group that became pregnant 71 per cent were of low intelligence. It is stated by the author that no sterility could be shown to have resulted from the use of the methods advised by the bureau.

This report is a valuable contribution to the literature on contraception.

M. N.

**PRINCIPLES OF BIOCHEMISTRY.**—By Albert P. Mathews, Ph.D. 1936. Baillière, Tindall and Cox, London. Pp. x plus 512. Price, 20s.

THIS is a textbook meant for medical students who have not the time to consult for themselves much of the original literature. As an experienced teacher of biochemistry for nearly 40 years, the author has tried to correlate and synthesize the numerous facts of

biochemistry and to make them a part of a great science which reveals the co-ordinated chemistry of the human body. The whole subject has been discussed under six main sections: (1) The chemistry and metabolism of the glucides, (2) The chemistry and metabolism of the lipides, (3) The chemistry and metabolism of the proteins, (4) The special chemistry of important tissues, blood and connective tissues, (5) The catalytic agents of growth and development, vitamins and hormones, and (6) The income of energy. The chemistry of the compounds dealt with in each section or sub-section has been discussed clearly and briefly, and the latest views about their constitution have been put forward. This is followed by a discussion of the metabolism of these compounds. All practical exercises have been omitted and references to the literature have been avoided since the author did not intend it to be a reference handbook. The subjects have been presented in a logical sequence which makes the book a very pleasant study instead of appearing as an assembly of facts. The lucid manner in which the subjects have been discussed will profit not only the medical student, for whom it has been primarily written, but also any other reader who is interested in this growing and extremely fascinating science of biochemistry.

S. G.

**STEDMAN'S MEDICAL DICTIONARY.**—By Thomas L. Stedman, A.M., M.D. Thirteenth Revised Edition. 1936. Baillière, Tindall and Cox, London. Pp. xii plus 1291. Illustrated, and with 22 plates. Price, 35s.

It is just three years ago since we had the pleasure of reviewing the twelfth edition of this, one of the best of the medical dictionaries.

One of the reasons for the appearance of the thirteenth edition is that many changes have been made in the names used in the new editions of the U. S. Pharmacopœia and the National Formulary. Considerable additions have also been made as the present edition contains 35 pages more than the previous one.

There is little need to review a dictionary in detail and it should suffice to say that the contents of this book maintain the high standard of usefulness of former editions.

P. A. M.

**PRINCIPLES AND FOIBLES OF CANCER RESEARCH—IN REGARD TO ETIOLOGY AND NATURE.**—By Wm. Reinhoff, Sr., M.D., F.A.C.S. 1936. Waverly Press, Inc., Baltimore, Maryland. Pp. vii plus 200

THIS book is a distinctly remarkable achievement for it is a review of the present position regarding cancer research and a summary of practically all the work done on this subject. To the reviewer whose work lies in other directions and so does not allow leisure to follow cancer research in all its details the book was a revelation and the main impression he received while reading it was that cancer research is somewhat like the disease itself in that it has become thoroughly unwieldy and has invaded all branches of medical science, often, as the author of this small volume shows, without any sound reasoning to warrant it.

The first part or preamble is devoted to considerations underlying research in its widest sense including philosophical and metaphysical discussions and might be read with advantage by any medical research worker, at the outset of his career, whatever branch of research he is going to pursue. The second part is more specially devoted to considerations of cancer research, what lines are considered by the author to be worthy

of pursuit and indicating where cancer research has wandered from the true path into by-ways that have led or will inevitably lead to dead ends.

It is a book that will excite considerable controversy as all the tenets of the author will not be accepted by every experienced cancer research worker, but it is a useful book as it is an attempt to stem the flood of inconsequential and unscientific researches which at present appear to be cumbering the path of real advance, and if it succeeds in this, even only in part, it will not have been written in vain.

Unfortunately the author has not the power of clear expression so it is often difficult to follow him in his somewhat abstruse reasoning, and this difficulty is not lessened by his habit of giving his references in brackets often right in the middle of a long and obscure sentence.

**RECENT ADVANCES IN ALLERGY. (ASTHMA, HAY-FEVER, ECZEMA, MIGRAINE, ETC.).**—By George W. Bray, M.B., Ch.M. (Sydney), M.R.C.P. (Lond.). Third Edition. 1937. J. and A. Churchill, Limited, London. Pp. xv plus 517, with 107 illustrations including 4 coloured plates. Price, 15s.

THE subject of allergy has made rapid strides since it first became a matter for intensive laboratory investigation about the year 1920, but its progress does not seem to be slowing down. During the last three years—since the last edition of this very valuable contribution to the subject appeared—no very dramatic advances have been made. Nevertheless, much ground has been covered and a new edition incorporating recent work is very welcome.

We naturally turn to asthma as being the type disease of the group. Here the author is probably at his best, as it is a subject to which he himself has given his whole time for a number of years. His account of the treatment of the disease is as simplified as it is possible to make this very difficult and many-faceted subject. Numerous forms of treatment are mentioned but they are arranged methodically under suitable headings, even if he does fall back on a non-committal expression, such as, 'success has been claimed', rather often. He lays great emphasis on breathing exercises and gives detailed instructions how these may be carried out.

Other sections are equally satisfactory. The book is well referenced and there is an author's as well as a subject-index, and in every way the book is a worthy member of this most excellent series.

L. E. N.

**APPLIED PHYSIOLOGY.**—By S. Wright, M.D., F.R.C.P. Sixth Edition. 1936. Oxford University Press, London. Humphrey Milford. Pp. xxxii plus 686. Illustrated. Price, 20s. Obtainable from Oxford University Press, Bombay, India.

To the physician, the publication in 1926 of Sampson Wright's *Applied Physiology* was an event of very great importance, as it gave him an opportunity of revising and bringing up to date his knowledge in the subjects in physiology that were directly applicable to his every-day practice, without re-reading his textbooks and wading through the physiological journals. To the post-graduate student studying for higher examinations, it was even more important.

The book was a new departure and one that had a marked effect on medical practice amongst English-speaking people. That was just ten years ago. In the intervening years there have been four new editions and many reprintings of this excellent book, so, it is to be hoped, the author and the publishers have reaped their reward.

There is little that need be said about the present edition except that it has been brought completely up to date. There has been a revision of every section and in some considerable re-arrangement.

In the chapter on the blood a new coloured plate has been added, and so much recent work has been included in this chapter that, without referring back to a previous edition, one can say that it has been entirely re-written. The author, we are glad to note, emphasizes the meaninglessness of the expression 'percentage of

hæmoglobin', so frequently used without any mention of the standard, in medical literature.

The book still remains the most valuable non-clinical book that the practitioner can possess.

L. E. N.

## Abstracts from Reports

### ANNUAL REPORT ON THE WORKING OF THE CIVIL HOSPITALS AND DISPENSARIES IN THE MADRAS PRESIDENCY FOR THE YEAR 1935

*Labour cases.*—During the year 90,910 normal and 15,913 abnormal labour cases were conducted in all classes of medical institutions, the corresponding figures for 1934 being 84,599 normal and 13,941 abnormal. The increase in the number of labour cases shows the tendency on the part of the female population to come to medical institutions for maternity relief.

*Kala-azar.*—During the year under report 2,130 cases of kala-azar were treated in all the medical institutions in the Presidency, of which 857, 566 and 490 were treated in the districts of Madras, Ramnad and Tinnevely respectively.

*Tuberculosis.*—The total number of patients treated for tuberculosis (tuberculosis of the lung and other tuberculous diseases) in all the medical institutions during the year was 77,412 with 1,413 deaths. The superintendent, tuberculosis hospital, Madras, reports that on an average the period of stay of the cases that improved by treatment was 61 days. Observation of the employees of the government press, Madras, was continued during the year by the director, tuberculosis institute, Madras. The director reports that an attempt has been made for the tuberculosis institute to serve as a centre for after-treatment of cases discharged from other hospitals and sanatoria in the presidency and outside.

*Anti-rabic treatment.*—During the year 192,269 doses of anti-rabic vaccine have been issued to all the authorized treatment centres in Southern India. The total number of patients who received treatment during the year was 535 at the Pasteur Institute, Coonoor, and 14,084 at all local centres. Thirty-one new centres were opened in the presidency. Twenty-one medical officers were trained at the Pasteur Institute, Coonoor, in the technique of anti-rabic treatment during the year, for the charge of the newly opened centres.

*Leprosy.*—Steady progress was maintained in the leprosy campaign during the year 1935. Local boards and the public are showing increased interest in the work. The number of clinics at the end of the year was 441, of which 36 were opened during the year. All the government medical institutions and almost all local fund and municipal medical institutions and about 50 subsidized rural dispensaries have leprosy clinics. More clinics can be opened in the subsidized rural dispensaries if facilities are given. Medical officers are becoming less pessimistic about the work and many of them are working whole-heartedly. In some places efforts have been made by feeding them to persuade the poorer patients to be more regular in getting themselves treated. About 40,000 patients were treated during the year and about 809,000 injections were given to them at the clinics. The results in those who persevere in treatment were satisfactory, the chief aim being to arrest the disease. The same 12 leper asylums were functioning with a daily average strength of about 2,100 and with several patients on their waiting lists. They are now adopting the policy of housing the treatable infectious cases only with a view to benefiting them and the community at large by 'hospitalizing' them.

The district leprosy councils have been taking some interest in seeing that the work in the districts does not suffer for want of finance by addressing local boards and by stimulating public opinion. The chief leprosy officer in addition to his duties as a group leprosy officer has been co-ordinating the work done in all the clinics and asylums, directing the work of the group leprosy officers and supervising the work in the presidency. As people come to know more and more about the disease better co-operation may be expected.

*Venereal disease.*—The working of the venereal departments continues to be satisfactory, both in quantity and quality. Five thousand seven hundred and fifty new cases (males) and 1,400 new cases (females and children) were examined and treated in the venereal department of the Government General Hospital, Madras. The average daily attendance in that department consisted of 153 cases, of which 21 were new cases. Nine male doctors were trained in the department during the year. Propaganda by way of distribution of leaflets to the patients attending the department also forms part of the daily routine.

*Honorary medical officers.*—The Government passed orders on the recommendations of the committee appointed to extend further the system of honorary medical officers and the rules were revised with reference to the committee's recommendations. Applications were invited for appointments of honorary medical officers and they were appointed in many of the medical institutions in this presidency.

*Medical education.*—During the year under report medical education in this presidency has maintained its reputation and several important investigations and researches were conducted by the staff of the two medical colleges. The year 1935 has been the centenary celebration of the Madras Medical College when His Excellency Lord Erskine, the then Governor of Madras, spoke very highly of the medical education in general and the Madras Medical College in particular. To get the required number of pupils to join the Lady Willingdon Medical School for Women, the Government increased the number of stipends to 15 and also reduced the fees for non-Madrassi students.

### THE MISSION TO LEPERS, SEPTEMBER 1935 TO AUGUST 1936

#### A REVIEW OF THE YEAR'S MEDICAL RETURNS

By JOHN LOWE

(Research Worker in Leprosy, School of Tropical Medicine, Calcutta)

Honorary Medical Adviser, Indian Auxiliary

I HAVE read with interest the medical returns for the year 1935 of the work done by the Mission to Lepers in 43 different stations in India. The figures are impressive—roughly 17,000 patients treated, nearly 9,500 as inpatients and the rest as outpatients, nearly 7,000 patients showing improvement, 1,463 showing arrest of the disease and 771 inpatients discharged, most of them without deformities.

From my personal knowledge of the work of some of these institutions, I can realize what skill, patience and hard work have been necessary to produce these

results. I know the factors which militate against the production of better numerical returns, the severe cases remaining in institutions many years, and the consequent difficulty of finding room for the admission of many slighter cases which might later help to swell the number reported as arrested or discharged. Nevertheless each year the number of patients treated, and the number of patients showing improvement and arrest of the disease steadily but slowly increase. It is clear that the Mission is giving every possible encouragement to the development of the medical side of the work and that the medical staff and resources of the Mission are being used to very great advantage.

The institutions of the Mission, by isolating and treating so many patients, are doing work of great value from the medical and public health standpoint. Their steady work, year after year, is a very valuable contribution to anti-leprosy work. Other types of work are needed, work on a bigger scale, general propaganda and survey work, outpatient treatment centres, home or village isolation and so on, and to this work the Mission sometimes lends a helping hand, but the adequate maintenance of its own institutions is the most valuable contribution which the Mission can make.

The figures given in the medical report corroborate one's general impression that, when the disease is well established in the body, to get clinical improvement is fairly easy in many cases, but to get arrest of the disease is difficult and sometimes impossible. The limitations of treatment of leprosy are apparent. How can the Mission use its resources and develop its work to the best advantage?

There is an obvious need for increased effort to control the disease in childhood before it has obtained such a hold that arrest is difficult or impossible. Most of the Mission's institutions have homes for healthy children of leper parents and for leper children. Such homes should provide the best hygienic conditions possible and adequate medical supervision in order to give the children the best chance of overcoming slight or latent infections. The extension of this type of work is greatly needed and it is a type of work which can in most places be best undertaken by the Mission. It must, however, not be overdone. It is, I think, wrong to admit children to leprosy institutions and homes unless there is a real necessity for doing so, unless they either have the disease in an active form or else are living in close contact with infectious people and running a grave risk of contracting the disease. There are in India many thousands of such children. Temporary admission of healthy children exposed to infection until it is clear that they are not suffering from the disease, that their physical condition is really good and that some other suitable arrangements can be made for them, and more permanent admission of those who are showing definite signs of active leprosy, might save many of these children. The Mission might very well, during the next few years, concentrate on the further development of this side of their work along sound lines.

#### STATISTICS OF TREATMENT, 1935

##### Inpatients

Inmates under treatment at end of year ..	6,597
Inmates who received treatment for three months and upwards ..	9,420
Much improved ..	3,101
Slightly improved ..	2,373
Became worse ..	464
Had to stop treatment ..	209
Apparently stationary ..	766
Died or left ..	1,070
Cases arrested <i>without deformity</i> ..	920
Cases discharged <i>without deformity</i> ..	684
Cases arrested <i>with deformity</i> ..	401
Cases discharged <i>with deformity</i> ..	87
Cases arrested in a previous year but relapsed during the year ..	102

##### Outpatients

Number of outpatients treated ..	6,679
Cases improved ..	1,139
Cases arrested or became symptom-free ..	142

#### SIXTH ANNUAL REPORT OF THE ASSOCIATION FOR THE PREVENTION OF BLINDNESS, BENGAL, 1935-36

##### 1. INTRODUCTORY

IN presenting the sixth annual report of the Association for the Prevention of Blindness, Bengal, the committee are glad to report that the activities of the association continue to grow steadily. Unfortunately, progress must of necessity be slow owing to still limited finances. Much however has been accomplished in the year under review, and it is gratifying to know that the popularity of the campaign in the prevention of blindness is more apparent amongst the lay public in Bengal. The committee are very pleased to announce that one of their principal aims has now been achieved, namely, the first travelling eye dispensary which is the first of its kind to be started in India. It owes its existence largely to a gift of Rs. 35,000 which has been presented by the Committee of Their Majesties' Silver Jubilee Fund. This sum represents the budget for maintaining the dispensary for a period of five years. The initial cost of the motor ambulance and its equipment and appliances have been met from the general funds of the association.

The Jubilee Travelling Eye Dispensary started its work on the 28th March, 1936. It has been sent to the Burdwan division and will penetrate into the remotest villages and carry with it the benefits of modern ophthalmology and preach the gospel of prevention. Particulars of the work carried out by this travelling dispensary will be given in next year's annual report.

To medical men who have worked in India it has long been recognized that the great prevalence of blindness in India is due to the backwardness, ignorance, poverty and apathy of large masses of the people. In the villages and even in the towns also there is submerged a great mass of blind people who think themselves and are thought by their relations and friends to be irretrievably blind and who by a small operation could have their vision restored or at least be given a considerable degree of sight. Very commonly these are cases of cataract; cataract comes on early in India, and is often seen in people as young as 30 years of age. The greater proportion of these people could have their sight restored. Some of these go to hospital, especially if they are within fairly easy distance, but very great numbers do not go. They are too ignorant and fatalistic, too timid or perhaps they prefer to wait till the travelling quacks come along to couch their cataracts with disastrous results. Then there are juvenile cataracts which occur in children and the congenital ones which can all be cured by a simple operation performed by an eye doctor. One sees numbers of corneal opacities, a man, woman or child suffers from some kind of ophthalmia which, if it does not destroy his eyes altogether, leaves behind dense opacities and when these cover the pupils and result in blindness. But if, as there often is in such cases, any clear portion of the cornea is left intact, then there is always the chance that by the operation of iridectomy or the cutting of a new pupil in the clear portion of the cornea the sufferer may be restored to a measure of vision. But most of the people in the remote parts of the country do not know this and so they remain blind.

Epidemic dropsy, more commonly but erroneously called by the lay public beri-beri, is extremely common throughout Bengal. It affects all ages; even children do not escape the disease. Glaucoma affecting both eyes is a very common complication and unless treated

by an eye doctor immediately leads to partial or complete blindness from optic atrophy. Large numbers of people become blind from this terrible disease and yet if they would only undergo a small operation in time their eyesight would not have been lost.

One sees large numbers of cases of entropion, where owing to the effects, generally of trachoma or granular ophthalmia, the eyelashes of the patient are turned into the eye and the cornea is slowly sloughed away. These cases call for operation and can be alleviated in that way and the sight saved.

Then again there are vast numbers of people suffering from inflammatory eye diseases which, if left untreated, will lead to loss or impairment of vision and which from their infectious nature are a source of danger to their relations and friends. Now all these cases of cataract, glaucoma, opacities, inflammatory diseases want ferreting out and helping, and it can be quickly realized to what an enormous benefit a travelling eye dispensary can be in carrying out this work.

Prevention is still more important than the actual curing of eye diseases. For, in addition to the multitude of partly or totally blind people who can have their sight restored by operation or treatment, there is still a very large population who cannot be cured but if they had been seen at an earlier stage their sight would never have been lost and their blindness could have been prevented. It is unfortunately not realized by the public that every day, year after year, the same process is going on, the process of recruiting the ranks of the blind out of the numbers of people suffering from eye diseases which, if not treated, will result in total blindness. There are, according to the census returns, some 600,000 blind in India and it is probable 400,000 to 500,000 need not have been blind if they were properly treated in time, and as the older people die off their places are taken by others and in every generation four or five hundred thousand people go blind who should never have been so.

Ophthalmia neonatorum can be easily prevented by prophylactic treatment which consists in putting 1 per cent silver nitrate into the baby's eyes immediately after birth.

Smallpox is still very common in Bengal and a frequent cause of blindness; smallpox would be non-existent if vaccination and re-vaccination every five years were carried out in all persons.

In matters of prevention as well as in treatment it can be seen of what tremendous use a travelling eye dispensary can be in the villages of Bengal.

Until such time as there are sufficient well-equipped eye hospitals scattered throughout Bengal, and this will take very many years, it is the ambition of the Association for the Prevention of Blindness, Bengal, to have as a minimum five travelling eye dispensaries, namely, one for each division.

## 2. PROPAGANDA WORK

During the year more coloured posters were prepared and printed and distributed through the Bengal Branch of the Indian Red Cross Society to various hospitals and dispensaries in the province. They were also distributed to medical men and others interested in the movement of prevention of blindness. There was a great demand for these posters and they received great praise from all quarters. It has been found by experience that posters which are simple and colourful attract the interest of the public and are one of the most useful ways of instruction in methods of prevention of blindness.

Magic lantern slides form another important part in propaganda work. The association is well equipped with coloured and simple slides which are excellent. It possesses two magic lantern slide lectures entitled:—

- (1) 'Care of the Eyes' with 32 slides.
- (2) 'Prevention of Blindness' with 54 slides.

These slides have been made by the Y. M. C. A. Lecture Department, 5, Russell Street, Calcutta, from

posters belonging to the association. Copies of these slides can be obtained at a small cost at the above address and copies of the lecture can also be obtained from the office of the Association for the Prevention of Blindness, Bengal, at the Eye Infirmary, Medical College Hospitals, Calcutta.

As mentioned in last year's annual report, the sum of Rs. 1,650 was presented by the Indian Red Cross Society for lectures and educating teachers in the schools and colleges of Bengal, in prevention of blindness. These lectures still continue to be given and are very popular. They are given by trained ophthalmologists under the direction and supervision of the honorary secretary of the association. They are essentially practical and consist of simple methods in prevention and treatment together with magic lantern slide demonstrations. A special syllabus has been prepared and printed for the guidance of these lecturers. They are paid Rs. 10 per lecture, e.g., Rs. 20 for two lectures which constitute a course for each school or college. Difficulty is being experienced in finding the travelling expenses of the lecturers, otherwise lectures and demonstrations could be given in more districts and subdivisions in Bengal. Judging by the letters of appreciation which are being received, these courses of lectures are very popular and supply a much needed want. The lectures are primarily intended for teachers but senior students are also encouraged to attend and they do so in large numbers. A discussion is invited after each lecture and questions explained and answered by the lecturer.

The association is well equipped with booklets on subjects which are important in the prevention of blindness and the care of eye diseases. They are written by ophthalmologists in very simple language and well illustrated. These booklets are being gradually translated into Bengali and Urdu. Requests for copies of the booklets and posters keep coming from different parts in and outside Bengal.

A new cinema film in two reels entitled 'Lamps of Life' has now been completed and is most excellent. This film has been made partly from actual scenes in the Eye Infirmary, Medical College, Calcutta, and partly in the mofussil of the Burdwan district. The association is much indebted to Mr. R. Johnston, I.C.S., District Magistrate of Burdwan, who has taken the photographs and has taken tremendous trouble to make the film a success. The characters are Bengalees and the captions are written in English and Bengali. Copies of this cinema can be obtained from Messrs. Houghton Butcher (Eastern), Ltd., 10, Hungerford Street, Calcutta, at a cost of about Rs. 100.

It is hoped in the coming year to show this cinema freely in Calcutta and copies will be provided for the Jubilee Travelling Eye Dispensary and lecturers in the mofussil. Cinema films are undoubtedly far and away the best method of spreading information on prevention and treatment of blindness.

During the year, epidemic dropsy again broke out in many parts of Bengal. Outbreaks also occurred in parts of Bihar, the United Provinces and Burma. The disease is almost exclusively confined to Bengalees. It is more commonly called beri-beri by the public although it is an entirely different disease. As pointed out in last year's report, glaucoma is a frequent complication of epidemic dropsy and, unless the correct treatment is given, it leads to partial and often complete blindness. It is a disease that can, to a large extent, be prevented and information for its prevention and cure has been disseminated on many occasions through the lay papers and the radio with satisfactory results. Large numbers of patients suffering from epidemic dropsy glaucoma, in all its stages, present themselves at the various hospitals in Calcutta for treatment.

If one visits the various outpatients' departments at the eye hospitals in Calcutta, one sees piteous sights of young, adults, middle-aged and old people blinded by this disease. A booklet on epidemic dropsy glaucoma has been brought out by the association and copies of this can be obtained on request.



As in the past the association took a prominent part at the Annual Health Exhibition held in the Museum, Calcutta, and ran the Blindness Stall. Many other health exhibitions held in and out of Calcutta were helped by the association with materials for sections on prevention of blindness.

[The above abstract shows what a live and progressive body this association is, and that in the six years of its existence it has maintained its progress in spite of the fact that this period included the worst years of trade depression when even firmly established charitable organizations suffered severely. The executive of this association is to be congratulated on the manner in which it is steadily expanding its activities and we know of no more worthy object to which the charitably-minded might subscribe, for it is clear from this report that any funds available are carefully and economically spent so that the subscriber can feel assured his money is being expended in full for the object for which it was given.]

#### ANNUAL REPORT ON THE CIVIL HOSPITALS AND DISPENSARIES IN THE CENTRAL PROVINCES AND BERAR FOR THE YEAR 1935. BY COLONEL N. M. WILSON, O.B.E., I.M.S., INSPECTOR-GENERAL OF CIVIL HOSPITALS, CENTRAL PROVINCES

*Dispensaries.*—The number of hospitals and dispensaries at the close of the preceding year was 336. During the year 1935 four new dispensaries were opened, viz, the private non-aided mission dispensary at Patpara in the Mandla district, the cheap plan dispensary at Fatekherda in the Buldana district, Shrimati Laxmibai Deshmukh Women's Hospital at Murtizapur in the Akola district and the Ramrama Mine Dispensary in the Balaghat district. Owing to the closure of the Pulgaon Mill, the dispensary attached to that mill was closed during the year. Thus, the number of hospitals and dispensaries open at the close of the year was 339, of which 164 were rural and 175 urban.

Taking into account the number of dispensaries at which the public ask for free attendance, the average area covered by a dispensary comes to 476 sq. miles, while the average population works out to 73,846. This is a proof that medical relief in the province is inadequate and the opening of more dispensaries is a necessity for the spread of medical relief in rural areas. But in these days of economic depression deputy commissioners find it very difficult to raise money by private subscriptions to fulfil the conditions for opening cheap plan dispensaries; so unless the economic condition of the villagers shows a decided improvement or the condition of raising a local contribution of Rs. 8,500 on account of endowment fund and half building charges is relaxed, further progress in the matter is not possible.

*Mayo Hospital.*—The general condition of the buildings which comprise the Mayo Hospital is very poor. There is no modern system of sanitation throughout the building and its area; in consequence, patients are put to great discomfort and inconvenience. There is an inadequate water-supply which is dependent on the local town supply; no system exists of overhead tanks by which the hospital can be regularly supplied with water for drinking and ablution purposes.

The nurses' quarters, even from a low standard, leave much to be desired and in consequence the civil surgeon finds great difficulty in retaining the services of capable and well-trained nurses. The ward equipment which includes blankets and sheets is poor and totally inadequate. In general, the Mayo Hospital, though considered the chief hospital of the province, is far below the standard recognized for a modern hospital.

*Distribution of medical personnel.*—The strength of the medical personnel working in all classes of hospitals and dispensaries in the province during the year under report was 1,146 (1,089), of which 123 (118) were in the

hospitals and dispensaries at provincial headquarters, 692 (648) in those at district headquarters and other urban areas and 331 (323) in those in rural areas.

*Nurses.*—The staff of nurses at the provincialized hospitals is still inadequate and, as stated last year, unless money is available for providing proper quarters for nurses, no increase in the nursing staff is possible. The three training centres for probationer nurses—the Mayo Hospital, Nagpur, the Victoria Hospital, Jabulpore, and the Irwin Hospital, Amraoti—continued during the year, while the one at Raipur could not be opened for want of nurses' quarters. Staff nurses were employed at the main hospitals at Saugor, Wardha and Akola.

*Honorary physicians and surgeons.*—Independent medical practitioners held honorary appointments of physicians, surgeons, dentists and specialists in eye, ear, nose and throat departments at the Mayo Hospital, Nagpur, the Victoria Hospital, Jabulpore, the Irwin Hospital, Amraoti, the Silver Jubilee Hospital, Raipur, and the Main Hospital, Akola.

Malaria was more prevalent during the year and showed an increase of 80,024 over the figures of the preceding year. The increase was noticed in all districts, excepting Drug.

The number of cases treated for smallpox during the year was 462 (729), of which 84 were vaccinated, 191 not vaccinated, while the vaccinal condition of the remainder was not known.

The local Government has approved of the proposal to establish a tuberculosis clinic at each divisional headquarters of the province and to provide beds at the Union Mission Tuberculosis Sanatorium at Pendra Road in the Bilaspur district.

*Financial condition.*—The year opened with a cash balance of Rs. 13,40,999, and closed with a balance of Rs. 13,43,010, showing an increase of Rs. 2,011. The total receipts, including the opening balances, amounted to Rs. 26,74,249 (Rs. 25,79,304). The amount of Government contributions paid during the year was Rs. 7,05,737 (Rs. 6,99,898), while the contributions from local and municipal bodies amounted to Rs. 2,92,992 (Rs. 2,49,395). The other receipts items were Rs. 65,717 (67,619) from fees and contributions from patients, Rs. 78,743 (72,185) from funds collected by hospital committees and Rs. 1,90,061 (1,53,963) from miscellaneous sources.

Some of the local bodies have been irregular in the paying of their contributions. The present economic depression is largely responsible for this irregularity; unless payments are regular, it will not be possible to run the dispensaries efficiently. The Deputy Commissioner, Wardha, reports that it may be advisable to deduct the amounts of the contributions from the Government grants for general purposes in the case of those local bodies which have made persistent defaults in the past.

*Ticket system.*—The half-anna ticket system was continued as an experimental measure during this year also at hospitals and dispensaries situated at *tahsil* and district headquarters. The continuance or otherwise of this system will be considered in due course on receipt of reports, regarding its utility, from local authorities. In any case, the time has come when funds should be raised by special taxation for the upkeep of hospitals. The total expenditure during the year amounted to Rs. 13,31,239 (Rs. 12,40,779), which shows an increase of Rs. 90,460.

*Silver Jubilee Fund.*—The Silver Jubilee of His Majesty the late King-Emperor marks a memorable period in the history of medical activities in this province. The private generosity displayed on this occasion has resulted in the establishment of two women's hospitals in Berar and the carrying out of improvements to existing medical institutions in the province, many of which, starving for want of funds, have been relieved to an appreciable extent.

The Central Provinces and Berar branch of the Indian Red Cross Society has decided to place at the disposal



of Government a sum not exceeding Rs. 40,000 from its share of the Silver Jubilee Fund partially to meet the cost of the tuberculosis scheme enumerated above. It has also distributed a sum of Rs. 73,695 to various hospitals and dispensaries in the province for the relief of the sick. The Dufferin Fund has decided to distribute from its share of the Silver Jubilee Fund a sum of Rs. 1,66,000 to the different hospitals in the province for the treatment of women and children.

*Septic tank latrines.*—Literature on septic tank latrines was printed and distributed along with copies of plans to all civil surgeons; in consequence, great strides have been made in the construction of septic tanks for the disposal of sewage at hospitals throughout the province. I hope that this system will be adopted throughout the province and once and for all do away with the appalling corrugated iron latrines which are an eyesore to any institution.

# SIXTY-EIGHTH ANNUAL REPORT OF THE DIRECTOR OF PUBLIC HEALTH OF THE UNITED PROVINCES OF AGRA AND OUDH FOR THE YEAR ENDING 31ST DECEMBER, 1935

## GENERAL HEALTH OF THE PROVINCE

THE death rate in 1935 in these provinces from all causes showed a decrease of 1.97 as compared with the figures of the preceding year, the rates for the two years being 24.78 and 26.75, respectively, per thousand of population. The decrease was chiefly noticeable under cholera and plague.

In the table appended below have been compared the death rates from the most important diseases and it would appear that 1935 has shown particularly low death rates in a few cases as compared to decennial averages:

The total quantities of potash permanganate, kaolin and essential oils mixture supplied during the year from the provincial allotments were 44,106, 8,987, and 2,154 lb., respectively.

The scheme regarding early reporting of outbreaks of cholera by patwaris in the districts of Gorakhpur, Basti and Azamgarh has been extended to another year.

*Inoculations.*—The total number of inoculations performed by different agencies including travelling dispensaries was 207,620—115,026 were performed by travelling dispensaries, 48,674 by district health staff and the remaining 43,920 by other agencies.

*Plague.*—Twenty-three thousand and nineteen deaths were due to plague during the year under review against 47,688 in the previous year. The rates per 1,000 of the population for the two years were, respectively, 0.47 and 0.98 and the mean for the previous five years was 0.50.

The mortality from plague during the year under report has shown considerable decrease since 1925 excepting the years 1927, 1930, 1932 and 1933.

The highest mortality (6,426) occurred in April and the lowest (54) in August.

*Inoculations.*—The total number of inoculations performed was 207,991 of which 102,411 inoculations were performed by travelling dispensaries (including reserve and temporary medical officers), 77,286 by district health staff and 28,294 by different agencies. Plague inoculations are now becoming popular particularly amongst educated people.

*Evacuation.*—Evacuation of infected dwellings as usual proved useful in checking the spread of the disease. Rs. 6,632 were placed at the disposal of district magistrates to assist people in evacuating their houses and for other anti-plague measures.

*Rat destruction.*—Anti-rat campaign was carried out in 22 districts, 36 municipalities and 6 notified areas. Rat destruction was mainly carried out by means of barium carbonate and rat trapping. In addition to this

Chief causes of mortality	Death rate per mille for 1934	Death rate per mille for 1935	Average death rate for preceding ten years 1925 to 1934	Increase or decrease as com- pared with 1934	Increase or decrease as com- pared with decen- nial average
Cholera .. ..	0.66	0.21	0.59	— 0.45	— 0.38
Smallpox .. ..	0.31	0.54	0.18	+ 0.23	+ 0.36
Plague .. ..	0.98	0.47	0.78	— 0.51	— 0.31
Fever .. ..	20.04	19.20	18.45	— 0.84	+ 0.75
Dysentery and diarrhoea ..	0.37	0.38	0.30	+ 0.01	+ 0.08
Respiratory diseases ..	0.96	0.95	0.73	— 0.01	+ 0.22
Injuries .. ..	0.43	0.41	0.45	— 0.02	— 0.04
All other causes .. ..	2.99	2.61	2.78	— 0.38	— 0.17
All causes .. ..	26.75	24.78	24.29	— 1.97	+ 0.49

*Cholera.*—During the year under report cholera accounted for 10,412 deaths against 31,903 in the previous year. The rates per 1,000 of the population for the two years were, respectively, 0.21 and 0.66 and the quinquennial average was 0.58. The maximum mortality (1,907) occurred in April and the minimum (8) in December.

*Anti-cholera scheme.*—For want of funds this scheme could not be extended to any more districts than 23 in which it has been in operation for the last several years.

cyanogas fumigation was also started in the districts of Moradabad, Saharanpur, Muzaffarnagar, Meerut, Bulandshahr and in the municipalities of Meerut, Cawnpore and Hardwar, but had to be stopped for want of funds. The total number of rats killed was 2,167,087. Most of the local bodies appreciated this measure and continued it from their own funds even when the Government grant was not available. It is advantageous to continue anti-rat campaign from year to year as this minimizes chances of outbreaks of plague. Cyanogas fumigation deserves more extensive trial and

efforts will be made to push it on as funds are available.

Four thousand two hundred and twenty pounds of barium carbonate were supplied free of charge to districts and municipalities and a grant-in-aid aggregating Rs. 6,785 was given to district magistrates and local bodies for expenses on preventive measures.

Disinfection of plague-infected houses was done by means of slow fire or Indian torch flame. This has proved to be the cheapest and most effective measure of disinfection.

**Smallpox.**—Smallpox was responsible for 26,032 deaths in 1935, against 14,817 in the preceding year. The death rates for the two years were 0.54 and 0.31 respectively, and the quinquennial average 0.18. Of the 26,032 deaths, 6,432 occurred amongst children under one year of age, 9,282 between the ages of one to ten years and the rest among adults. The highest mortality (5,264) was recorded in May and the lowest (260) in October.

**Fevers.**—During 1935, fevers accounted for 929,298 deaths as compared with 970,289 in 1934, yielding a death rate of 19.20 and 20.04 respectively. The quinquennial average was 18.81. The maximum mortality (101,557) was recorded in June and the minimum (64,167) in December. Malaria was responsible for 813,591 deaths, other fevers for 81,907, measles for 23,460, enteric fever for 8,575, cerebro-spinal fever for 756, influenza for 437, relapsing fever for 213, diphtheria for 105, kala-azar for 101, typhus for 76 and acute poliomyelitis for 74.

**Tuberculosis.**—During 1935, 5,698 deaths from tuberculosis were registered in the municipalities of the United Provinces against 4,402 in the preceding year. Seven thousand three hundred and twenty-five deaths were returned from phthisis during the year, 6,952 in urban areas and 373 in rural areas.

**Dysentery and diarrhoea.**—The total number of deaths due to dysentery and diarrhoea during 1935 was 18,283 against 18,140 in 1934. The corresponding death rates for the two years were 0.38 and 0.37 respectively, and the quinquennial average 0.31. The highest number of deaths occurred in May and June, the number for each month being 2,184 while the lowest number (854) was recorded in January.

**Respiratory diseases.**—These diseases were reported to have caused 46,270 deaths during the year under report against 46,567 in the preceding year, the death rates for the two years being 0.95 and 0.96 respectively. The mean for the previous five years was 0.78. The maximum number of deaths (5,194) was returned in May and the minimum (3,006) in July.

**Cerebro-spinal meningitis.**—Seven hundred and fifty-six deaths were reported from this disease during 1935—474 from towns and 282 from rural areas.

The disease was found usually to set in suddenly with irregular fever, intolerable piercing headache, repeated vomiting with rigidity in neck and dilated pupils in most cases. Positive Kernig's sign and delirium were also noticed in many cases. Moreover such motor defects as defective hearing and dimness of vision, aphasia, hemiplegia and flaccid paralysis with retention of urine were also observed in a certain number of cases. The unusual and grave complication during the convalescent period of the disease noticed was the development of thyroiditis which proved to be fatal in practically all cases in which it occurred.

The disease, though contagious, was found to be irregular in its distribution. The number of proved cases of direct contagion was very small. Unfavourable living and housing conditions, which are frequently a contributory cause of spread of other infectious diseases, appear to have played a much smaller part in the propagation of cerebro-spinal meningitis. Direct contagion therefore cannot be regarded as a very serious factor.

The majority of the cases occurred in persons between 10 to 30 years of age, than 35 to 45 years of age.

Children under two years and persons above 55 years were the least affected. It was observed that people of all communities were susceptible to the disease, but males were comparatively more affected than females. Cases were mostly reported from amongst the poorer classes.

Cases were mostly treated in dispensaries where specific treatment with lumbar puncture and repeated injections of anti-meningococcus serum were given.

**Epidemic dropsy (so-called beri-beri).**—There were 380 deaths from this disease—339 in urban area and 41 in rural area. The disease, though present in Benares in the month of October 1934, did not attract the attention of the general public till the end of November when cases began to be reported in large numbers. The disease appeared to have been imported into Benares city in the Bengali community from the presidency of Bengal and the neighbouring districts of the Bihar Province. Three hundred and four deaths were returned from Benares city alone.

The onset of the disease was insidious. The disease ran a course of four weeks to a few months. Only in a few cases was the onset sudden and the course less than a week. Generally the disease began with diarrhoea or nausea, which passed off unnoticed. The first warning came on with swelling of the shins which pitted on pressure, shortness of breath, palpitation of heart and low fever. Sometimes there were muscular pains, feeling of weakness or defective vision.

The disease was primarily confined to the Bengali community living in overcrowded, damp and ill-ventilated localities on the river-side wards of the town. It then spread to other communities and a few cases also occurred amongst Mohammedian and non-Bengali communities.

Investigations were made by the local officers to find out the possible causation of the disease. Samples of flour, mustard oil and rice were taken from several big shops and analyzed, but nothing definite could be elicited.

The measures adopted to check the spread of the disease were as follows:—

- (1) The houses where cases occurred were disinfected.
- (2) People were advised to take plenty of raw tomatoes, green vegetables, viz, carrots, peas, turnips, onions, salad and lettuce.
- (3) Leaflets giving symptoms and preventive measures were distributed. Posters were also printed and posted in streets and lanes.
- (4) Lectures were delivered by the hygiene publicity bureau.
- (5) Special attention was paid to the sanitation of the infected localities and sanitary inspectors were directed to keep strict watch on the sale of rotten fish, meat, eggs, fruits and vegetables in markets.
- (6) Samples of rice, atta and mustard oil were taken from the various shops of infected areas and sent to the public analyst for examination and report.
- (7) Vendors were persuaded to expose hand-milled rice for sale.
- (8) Overripe, decayed and rotten fruits and food articles were destroyed whenever detected.

#### FAIRS AND FESTIVALS

During 1935, the most important fair was the Magh Mela which was held at Allahabad from 14th January, to 18th February, 1935. The gathering on the chief bathing day (*Amavas*) was ten lakhs. The usual medical and sanitary arrangements, such as inspection of pilgrims travelling by rail and by road, the essential conservancy arrangements in the fair area, etc., were organized and guided by the assistant director of public health. Adequate arrangements for the supply of water were made. The wells in the mela area as well as those in Arail and Jhusi villages were permanganated periodically. Articles of food exposed for sale were regularly inspected. Temporary regulations under the Epidemic Diseases Act were enforced in the mela area

and in the Allahabad municipality. The standard of sanitation throughout the *mela* was kept at a very high standard and there was an entire absence of flies during the whole *mela* period. The general health of the pilgrims was excellent. Out of the seven cases of cholera detected in the *mela* area, five were imported. They were all admitted into the infectious diseases hospital. Vigorous measures were taken to check the spread of the disease. The contacts were given essential oils mixture and were inoculated and 621 anti-cholera inoculations were done. The activities of the hygiene publicity bureau in connection with this fair consisted of a public health exhibition, cinema shows and health songs and talks with the aid of loud speakers. Films on the Allahabad Kumbh, cholera, tuberculosis, small-pox, malaria, temperance, etc., were screened. These shows are very popular and attracted large crowds every evening.

The Piran Kaliar Fair was held at Roorkee (District Saharanpur) from 4th to 19th June, 1935. The medical and sanitary arrangements were organized by the district medical officer of health, Saharanpur, under the guidance of the assistant director of public health. Only four imported cases of cholera were detected in the fair area. One of these died and the rest were cured. Adequate measures to check the spread of the disease were taken and no more cases occurred.

The next important fair was the Dadri Fair which was held at Ballia from 7th to 22nd November, 1935. The arrangements of the fair were supervised by the assistant director of public health and the district medical officer of health, Ballia. The gathering at this fair on the chief bathing day was over three lakhs. The sanitary and medical arrangements were organized on the lines of the *Magh Mela*, Allahabad. The health of the pilgrims during the *mela* was good and not a single case of infectious disease was detected.

Analysis of railway water-supplies at important railway stations was also carried out during the important fairs and adequate steps were taken to disinfect water-supplies where necessary.

**Maternity and child welfare centres.**—One child welfare and three new maternity centres were opened during the year. The total number of centres both maternity and child welfare as well as maternity only at the end of the year was 223 (114 rural and 109 urban) and all these were run by the Red Cross. The Cotton Mills, Cawnpore, and the Dayal Bagh, Agra, also maintained one centre each. The maternity and child-welfare work in the rural areas of the province has received an impetus by the opening of nine modified health units.

The total expenditure during the year under report amounted to Rs. 1,47,886. The excess in expenditure was met from the opening balance of the last year. In addition to this, a sum of Rs. 80,000 was spent on maternity and child welfare work by local branches from local subscription, etc.

The number of medical women employed on preventive work in municipalities and other local bodies was 18.

The number of health visitors with diplomas in the municipalities was 10.

One medical woman (L.M.P.) and two Delhi trained health visitors worked in the Provincial Training Centre, Lucknow. One medical woman (M.B., B.S.) and two Lucknow trained health visitors worked in the Health Unit, Partabgarh.

The number of midwives employed was 293.

The training of probationer midwives was, as usual, carried out at the Provincial Training Centre, Lucknow, in domiciliary midwifery and house visiting. Twenty probationers out of 26 passed examinations during March and September and were awarded certificates by the State Medical Faculty, United Provinces, Lucknow.

Facility for midwifery training also existed in the Cawnpore, Maternity and Child Welfare Centre, Dufferin and Mission Hospitals, but these institutions only trained workers for their own needs.

A serious effort was made to train the *dais* throughout the province, specially in 25 maternity and child welfare centres, where medical women or health visitors were employed and in areas under the ten health units in the province.

Six hundred *dais* were trained during the year, of whom 278 were trained in the Partabgarh Health Unit. A sum of Rs. 1,00,000 has been sanctioned from the Silver Jubilee Fund for the building of a health school in Lucknow for the training of health visitors and midwives.

Modified health units were introduced in nine districts during the latter part of the year in connection with rural development work. The scheme in each modified health unit for maternity work consists of—

One health visitor.  
Six midwives.  
Six trained *dais*.

This work has great possibilities. The rural public is very appreciative of the good and substantial work done by these modified health units.

## Correspondence

### FOUR MAGGOT-LIKE WORMS REMOVED FROM THE LEFT CONJUNCTIVAL SAC OF A PATIENT

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—I am sending you herewith four maggot-like worms removed from the left conjunctival sac of a patient for examination; I hope it will be of interest to the medical profession.

The man experienced severe pain in his left eye at about 2 p.m. on the 10th December, 1936. Next morning at about 8 a.m. when he attended the hospital the lids were found to be oedematous and the conjunctiva congested.

On careful examination two dot-like particles were detected on the upper margin of the cornea and on removal were found to be moving; then two more

were detected and removed. The man felt relieved immediately.

Yours, etc.,  
R. GHOSE,  
Medical Officer,  
Semapur Sugar Works.

P. O. SEMAPUR FACTORY,  
DISTRICT PURNIA,  
11th December, 1936.

[Note.—No maggots were found in the box received by us from the correspondent; they appear to have been lost *en route*. On the subject of ophthalmomyiasis Dr. D. N. Roy, the assistant professor of entomology at the Calcutta School of Tropical Medicine, comments as follows:—

‘Although cases of ophthalmomyiasis have been occasionally reported from South America, Palestine,

Central Asia, Central Europe, North Africa and Russia, its incidence is by no means common. Almost all the larvæ recorded affecting the human eye belong to *Oestrus ovis*, the common sheep bot-fly. Though the larvæ are normally deposited at the entrance to the nostrils of sheep and subsequently make their way into the nasopharynx, they occasionally deposit one or two solitary larvæ in the vicinity of the human eye and these may either penetrate the mucous membrane of the lid or the lacrymal sac, or may enter the substance of the eye.—*EDITOR, I. M. G.]*

#### A CASE OF PARAPLEGIA AND HYDROPHOBIA FOLLOWING A FULL COURSE OF ANTI-RABIC TREATMENT

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—I have read the interesting note on a case of paraplegia and hydrophobia by Dr. S. C. Sen Gupta, D.T.M., published in the November 1936 issue of your journal. The prescription given therein does not appear to be a scientific one to me. In the first instance, potassium iodide is incompatible with liquor strychninæ hydrochloridi, and secondly, putting liquor strychninæ hydrochloridi (an acid preparation) in the same mixture as liquor arsenicalis (an alkaline preparation) comes to doing injustice to their respective reactions. Books on pharmacology seem to be clear on the subject, but since the prescription was passed un commented by you, and being a junior practitioner, I am in doubt. I therefore request that

I may kindly be enlightened in the matter through the medium of your valuable journal.

Yours, etc.,  
KESHAV NATH, L.S.M.F.

ANANTNAG, KASHMIR,  
14th December, 1936.

[Note.—We are afraid that we overlooked the fact that an incompatible mixture had been prescribed and we stand corrected by this 'junior practitioner'.

Our correspondent does not appear, however, to be so junior that he learnt his pharmacology from the British Pharmacopœia of 1932; he will find in this edition that liquor arsenicalis is a neutral solution.—*EDITOR, I. M. G.]*

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—I have read with interest a case of hydrophobia reported by Dr. S. C. Sen Gupta in your November 1936 issue.

The prescription with which Dr. Gupta's patient was treated was wrong. It contained three incompatibles; liquor strychninæ is incompatible with potassium iodide and also with liquor arsenicalis.

Yours, etc.,  
MUSHARRAFALI,  
Medical Officer in charge,  
Sadar Hospital.

HAMIRPUR, U. P.,  
4th December, 1936.

## Service Notes

### APPOINTMENTS AND TRANSFERS

THE Secretary of State for India in Council has appointed to the Civil Branch of the Indian Medical Service the following officers of the Indian Medical Service, with effect from the dates stated against their names:—

Lieutenant-Colonel F. J. Anderson, M.C. Dated 28th July, 1935.

Lieutenant-Colonel N. C. Kapur. Dated 15th November, 1935.

Lieutenant-Colonel H. E. Murray. Dated 22nd December, 1935.

Lieutenant-Colonel R. S. Aspinall, C.I.E., an Agency Surgeon, on return from leave is posted as Civil Surgeon, Sibi and Loralai, with effect from the forenoon of the 19th October, 1936.

Major Ajab Singh Garewal is confirmed in the Central Provinces Jail Department, with effect from the 14th August, 1935.

Major G. Verghese is confirmed in the Bihar Jail Department, with effect from the 13th December, 1935.

On reversion from foreign service under the Indian Research Fund Association, Captain J. R. Dogra is appointed as Supernumerary Officer at the Haffkine Institute, Bombay, with effect from the date on which he assumes charge of his duties.

The services of Captain Ilahi Bakhsh are placed temporarily at the disposal of the Government of the Punjab, with effect from the afternoon of the 25th September, 1936.

The services of Captain R. L. Raymond are placed temporarily at the disposal of the Government of Burma, with effect from the forenoon of the 5th November, 1936.

The services of Captain A. E. Kingston are placed temporarily at the disposal of the Government of Burma, with effect from the afternoon of the 11th November, 1936.

Captain G. F. Taylor, an Officiating Agency Surgeon, is confirmed as an Agency Surgeon under the Government of India in the Foreign and Political Department, with effect from the 18th December, 1935.

Captain F. W. Allinson is placed on general duty at the Medical College Hospitals, Calcutta, with effect from the 16th November, 1936.

Captain F. W. Allinson, on general duty at the Medical College Hospitals, Calcutta, is appointed as Civil Surgeon, Midnapore, vice Captain E. G. Montgomery, transferred.

### LEAVE

Lieutenant-Colonel J. C. Pyper, O.B.E., an Agency Surgeon, is granted leave on average pay for 8 months combined with leave on half average pay for 4 months, with effect from the afternoon of the 10th October, 1936.

Lieutenant-Colonel R. L. Vance, an Agency Surgeon, is granted, on medical certificate, leave on average pay for 21 days combined with leave on half average pay for 3 months and 9 days, with effect from the 1st November, 1936.

### PROMOTION

#### Majors to be Lieutenant-Colonels

R. Sen. Dated 7th August, 1936.

L. G. Pearson. Dated 18th November, 1936.

P. M. Antia. Dated 23rd November, 1936.

Note.—The promotion of Major S. L. Patney to the rank of Major is ante-dated to 2nd February, 1929. He qualified for accelerated promotion on 13th October, 1936.

The seniority of Lieutenant J. G. Thomson is ante-dated to the 1st May, 1935.

### RETIREMENT

Lieutenant-Colonel J. B. Hanafin, C.I.E. Dated 23rd October, 1936.

### RESIGNATION

Captain J. D. Gray resigns his commission. Dated 3rd September, 1936.

### RELINQUISHMENT

Lieutenant E. N. Brockway relinquishes his probationary appointment. Dated 24th September, 1936.

## Notes

### ERGOMETRINE B. D. H.

IN 1932 Dr. Chassar Moir published the results of his clinical experiments in which, by a special technique, he had found that the oral administration of aqueous extracts of ergot during the first few days of the puerperium produced remarkable contractions of the uterus within a few minutes. Contractions of equal intensity were not produced after the administration of the pure salts of ergotoxine, and even these less intensive contractions were considerably longer delayed. It was considered, as a result of this work, that the classical effect of ergot administration was after all due to some undiscovered principle and not solely to ergotoxine or any of the alkaloids or amino bodies hitherto isolated.

In March 1935 Drs. Dudley and Moir announced the isolation of a new alkaloid possessing the clinical properties previously described by Moir. This newly-discovered alkaloid has been named Ergometrine by Dudley and Moir.

Simultaneously A. K. Koff and Marvin R. Thompson, by dividing ergot extracts into alkaloidal fractions and non-alkaloidal fractions, found that the quickly-acting substance was contained in the alkaloidal fraction, and that it remained there after the removal of the previously-known alkaloids of ergot. It was considered, therefore, that the immediate contraction that follows the oral administration of certain liquid preparations of ergot is due to some hitherto undiscovered alkaloid of ergot, or at least to some principle contained in the 'residual alkaloid' of ergot.

Thus was provided the key to the solution of the problem which has been the subject of investigation for so many years of the difference between the clinical action of liquid extracts of ergot of rye and of the salts of the pure alkaloid ergotoxine.

Further, as was indicated by the earlier results of Moir, there is a striking difference between the action of ergometrine and the previously-known alkaloid of ergot—ergotoxine. The latter alkaloid, administered in doses of 2 to 3 milligrammes, provokes uterine contractions only after an interval of thirty-five minutes or more, and even these delayed contractions are erratic and somewhat feeble in character. Ergometrine, on the other hand, administered orally in a dose of 0.5 to 1 milligramme causes strong contractions which occur in six and a half to eight minutes after administration. The onset is sudden and accompanied by pronounced uterine spasm, which appears to be caused by a succession of contractions so rapid that the organ as a whole has no time to relax. This stage lasts for about an hour and is followed by a second stage, during which the uterus shows regular, vigorous, isolated contractions, continuing for an hour or more.

It is observed from the foregoing that ergometrine will prove of immense value in obstetrics, particularly on account of the fact that within six and a half minutes of the oral administration of a relatively small dose of it there is produced with unfailing regularity the same effect as that which hitherto has been obtained with so much uncertainty by the administration of the variable liquid extract of ergot.

Thus ergometrine provides that long-felt desideratum—an ergot preparation which acts rapidly and can be safely administered immediately after parturition.

Ergometrine B. D. H. is now available for the use of obstetricians and of general practitioners for oral administration in the form of tablets each containing 0.5 milligramme of the pure alkaloid.

For administration to patients who may still be under anaesthesia or who may be too ill to retain any medication administered by the mouth, Ergometrine B. D. H. is issued in solution in ampoules for intramuscular injection and for intravenous injection. In administering Ergometrine B. D. H. by injection the intramuscular

route is usually employed, the intravenous route being reserved for very urgent cases in which a maximum response is required in a minimum of time.

### ADRENALIN VAPORIZER AND ADRENALIN CHLORIDE SOLUTION 1 : 100

MESSRS. PARKE, DAVIS AND COMPANY have put on the market the above vaporizer and adrenalin chloride solution 1 : 100 for the inhalation treatment of bronchial asthma.

By this means we have a method of promptly relieving paroxysms without resorting to hypodermic injections.

This new method first reported by Graeser and Rowe (*Journal of Allergy*, 6 : 415, 1935), is based on the administration of a special solution of adrenalin chloride solution 1 : 100 by means of an adrenalin vaporizer. The results obtainable from the oral inhalation of this solution have been uniformly successful. Inhalation of the vapor-like spray of adrenalin 1 : 100 rarely causes the side effects, such as nervousness, tachycardia and other circulatory symptoms which may follow hypodermic administration of adrenalin solution. This treatment avoids the discomfort and inconvenience of injection and can be applied by the patient at home after detailed instructions have been given by the physician.

Further particulars may be obtained from Messrs. Parke, Davis and Company, P. O. Box 88, Bombay.

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## Original Articles

### RADIOLOGICAL AND LABORATORY INVESTIGATIONS OF CHRONIC GASTRO-INTESTINAL DISTURBANCES IN THE TROPICS

By R. N. CHOPRA, C.I.E., M.A., M.D. (Cantab.),  
M.R.C.P. (Lond.)

BREVET-COLONEL, I.M.S.

Honorary Physician to H. M. the King

R. T. M. HAYTER  
Resident Medical Officer

and  
S. N. BHATTACHARYA, M.B., D.T.M.  
Registrar

(From the School of Tropical Medicine and Carmichael Hospital for Tropical Diseases, Calcutta)

CLINICIANS in the tropics admit the existence of a group of chronic 'bowel' conditions in which a definite diagnosis cannot be made by the ordinary methods of examination. The majority of the patients belonging to this group have suffered in the past from chronic dysentery, either bacterial or protozoal in origin, and show diverse and often vague symptoms such as indefinite pains in the abdominal region, indigestion, flatulence, irregularity of the bowels, etc. In a number of them non-lactose-fermenting organisms such as *Bact. pseudo-carolinus*, *Bact. asiaticus*, *Salmonella morgani* are detected; in others cysts of *Entamoeba histolytica*, Charcot-Leyden crystals, flagellates such as *Giardia intestinalis* or *Trichomonas hominis* are found; in others helminthic parasites are discovered in the stools. Although it is natural at first to attribute the patients' symptoms to the particular infection found, it has been often observed that symptoms in many do not abate in spite of the eradication of such infections. The disturbances in these patients are, therefore, often put down as functional in nature or a vague term such as 'chronic dyspepsia' is used in their diagnosis. On going into the history of these patients it will be found that they are chronic sufferers who have been treating themselves with 'stomach powders', 'liver pills', 'salts', and have even received courses of emetine from their medical attendants, but with little or no permanent relief or benefit. The trouble goes on for years and some of them are described by their medical attendants as suffering from neurasthenia, a term used to cloak our ignorance in the tropics as often as anywhere else. We believe, that there is no such condition as neurasthenia without a definite organic lesion of some kind which is the source of irritation in some part of the body. The intensity of the symptoms produced varies with the degree of sensitiveness of the individual to the irritative stimuli from this source. The symptoms thus produced are reflex in origin and the sufferings of the individual may sometimes be severe, but frequently there may be

periods of intermission, when the patient feels comparatively well and may even think he is cured. A careful clinical examination of these patients shows that the classical textbook signs and symptoms of a definite gastro-intestinal lesion are, as a rule, absent. Some of them have been shown to have definite surgical lesions which are likely to be overlooked in ordinary examination. Such patients are seldom thoroughly enough investigated for a proper diagnosis to be aimed at even in hospitals, to say nothing of the private practitioners, as laboratory facilities for such detailed investigation are often not available. These patients, therefore, go on suffering for years till anæmia, emaciation or other complications and sequelæ supervene.

During recent years the senior author has had under his care a series of such cases in the Carmichael Hospital for Tropical Diseases, that were thoroughly investigated from every aspect. Besides detailed and thorough bacteriological and protozoological investigations, examination by x-rays after an opaque meal is essential in many of these cases to locate the lesion, and in this paper we give the result of the analysis of 80 patients in which this procedure was adopted.

Before discussing the results of the radiological examination we intend to go a little more into the symptomatology of these patients. As stated before, the symptoms were mostly of a subjective nature and they might be classified under three main heads, namely, abdominal pain and tenderness, gastric symptoms and intestinal symptoms.

(1) *Abdominal pain*.—Out of 80 patients 43 complained of pain in some part of the abdomen. A large number of the patients, 18 in this series, complained of pain in the epigastrium, nine had pain in the cæcal region and 16 in other parts of the abdomen. Three patients had definite hunger pains and three others complained of gripping and tenesmus such as are seen in acute dysentery. On palpation, tenderness and rigidity of muscles were elicited in 19 patients and out of these 11 had it in the region of the cæcum and ascending colon, five in the left side of the abdomen and three in the epigastrium. The large bowel showed thickening in some of them.

(2) *Gastric symptoms*.—These consisted chiefly of a feeling of heaviness after meals, heartburn, acid eructations, loss of appetite, nausea and occasional vomiting. Thirty-six patients in this series suffered from one or other of these symptoms.

(3) *Intestinal symptoms*.—Irregularity of the bowels was one of the main symptoms for which the patients sought admission into the hospital. Constipation occurred in 20, diarrhoea in 23, and constipation alternating with diarrhoea in 13. A large proportion of patients, as many as 23, passed mucus and ten passed mucus and blood



in their stools. Two patients had melæna and two occult blood in their stools. Flatulent distension was a common feature in 30 patients and often it was most distressing, the patient getting 'blown up' and the heart being secondarily affected by pressure.

The main radiological findings may be summarized as follows :—

(1) In one group, irregularity of the outline of the duodenal cap, pyloric spasm and filling defects were frequently seen, and in a few cases definite craters with barium content were found several hours after the stomach was empty. Duodenal distension with spasm and catarrh was often seen. Some of these patients undoubtedly had duodenitis and others showed signs of active or healed ulcers. In one patient, not included in this series, we found a diverticulum in the region of the duodenum.

We may also note here a condition which was not infrequently met with in a number of the patients and that was hurrying of the meal through the small intestines. In a few hours

transverse colon all seemed to be lying in the pelvis.

(5) In the fifth group there were definite signs of inflammation or ulceration in some part of colon, accompanied by excessive gas formation. In others there was abnormal irritability of the large gut and residual strings or streaks of barium were visible.

Classified according to what was considered to be the main radiological diagnosis, the patients could be grouped as follows :—

(1) Duodenal ulcer and duodenitis ..	16
(2) Pathological appendix ..	21
(3) Stasis of the intestine ..	26
(4) Atony of the gastro-intestinal tract	32
(5) Ptosis .. ..	7
(6) Catarrh .. ..	13
(7) Colitis .. ..	4
(8) Normal .. ..	13

The patients rarely suffered from any one of these conditions singly, a combination of these being the rule. The details are given below in a tabular form.

TABLE

	Total	Duodenal ulcer	Pathological appendix	Stasis	Atony	Ptosis	Catarrh	Colitis	Normal
Duodenal ulcer ..	16	..	3	2	3	..	1	..	..
Pathological appendix ..	21	3	..	4	6	..	4	..	..
Stasis ..	26	2	4	..	13	3	3	..	..
Atony ..	32	3	6	13	..	4	5	1	..
Ptosis ..	7	..	..	3	4	..	..	..	..
Catarrh ..	13	1	4	3	5	..	..	..	..
Colitis ..	4	..	..	..	1	..	..	..	..
Normal ..	13	..	..	..	..	..	..	..	..

the meal passed through the small gut, and reached the hepatic or the splenic flexure.

(2) In another group, the appendix was visualized for long periods, that is up to 72 hours after the meal—sluggish appendix. It was sometimes abnormally long, was distended, had constrictions in it, showed the presence of concretions and was often adherent to the cæcum. Such cases were classed as pathological appendix. The cæcum was frequently mobile and showed signs of ulceration or catarrh, which sometimes extended all the way down to the pelvic colon. Thickening and spasm of the colon were frequently seen.

(3) In the third group, abnormal delay in emptying, distension of the cæcum and the colon, often with marked visceroptosis, diverticulitis, stagnation of the contents and catarrh were the main features. In some of the cases the colon still retained the meal after 48 hours or longer. These cases were classified as intestinal stasis.

(4) In the fourth group, loss of muscular tone of the wall of the whole of the gastro-intestinal tract was seen and there was abnormal retention of contents. In some, visceroptosis was marked; the stomach, the small intestines and the

The various symptoms in relation to the different radiological findings will be better understood from the following descriptions :—

*Pain.*—Of the 16 patients in whom signs of ulceration were visible, only three had definite hunger pains. Six patients had pain in the epigastrium, without any definite relation to food. Two patients who complained of pain in the right iliac fossa also had pathological appendix. Some of these patients underwent operation and the diagnosis was confirmed. In those who had intestinal stasis, pain was a common symptom. Out of 20 cases in this series, 14 had it in some part of the abdomen. Of the ten patients who showed signs of atony of the gut only three, i.e., those in whom ptosis was present, complained of pain, which was confined to the upper part of the abdomen.

*Gastric symptoms.*—Out of 80 patients, 36 had symptoms referable to the stomach. Of these, 13 were found to be suffering from some lesion in the duodenum. When intestinal stasis was present gastric symptoms were also a common feature.

*Intestinal symptoms.*—Flatulent distension of the abdomen, constipation or constipation

alternating with diarrhoea, was a common feature among those patients in whom the skiagrams revealed a condition of loss of tone or a condition of intestinal stasis due to spasmodic contraction of the large gut. Out of the total 80, 23 had looseness of the bowels; as might be expected many of these had colitis and catarrhal condition of the bowels, but quite a number, seven in this series, showed involvement of the appendix and were diagnosed as pathological appendix. Banerji, Chopra and Ray (1936) have fully discussed these cases elsewhere. What we wish to stress here is that in those patients in whom the appendix was not cleared of the opaque meal after 24 hours (sluggish appendix) while the cæcum and ascending colon were empty, a pathological appendix was suspected, and those in which the appendix still retained the meal after 48 hours and longer a definite diagnosis of pathological appendix could be made. These results were confirmed by operation in a number of cases.

Thirty-three patients passed mucus in their stools, being generally those whose stools were diarrhoeic, though there were a few who passed streaks of mucus with constipated stools. Mucus was frequently observed in the stools of those in whom the appendix was pathological; it also occurred in those who had colitis and atonic or spastic conditions of the gut. Those who had acute colitis often passed both mucus and blood in their stools. The only case of duodenal ulceration that passed mucus and blood had an *E. histolytica* infection.

Of the patients who gave a history of melæna, one showed signs of duodenal ulceration, which was confirmed by radiological examination. In the other cases, no lesion was detected in the gastro-intestinal tract. The two cases with occult blood had heavy hookworm infections.

Anæmia was a common symptom in this series, 22 patients suffered from it. Of the four patients who showed a rise of temperature above normal while in hospital, two had malaria. The liver was enlarged in five cases of which three had *E. histolytica* infection.

A detailed microscopical and cultural examination of the stools was done in all this series. Five patients were found to be suffering from hookworm infection. *E. histolytica* was found in the stools of eight patients.

The bacterial organisms of doubtful pathogenicity, which were found in the stools by culture, are given below:—

Non-lactose fermenters—

(1) <i>Bact. pseudo-carolinus</i>	..	16
(2) " <i>alkaligenes</i>	..	14
(3) " <i>morgani</i>	..	4
(4) <i>Ps. pyocyanea</i>	..	4
(5) <i>Bact. asiaticum</i>	..	4
(6) " <i>para-asiaticum</i>	..	4
(7) " <i>pseudo-asiaticum</i>	..	2

(Continued at foot of next column)

## INDIVIDUAL VARIATIONS IN THE EFFECTIVENESS OF SYNTHETIC ANTIMALARIAL DRUGS (A PRELIMINARY NOTE)

By R. N. CHOPRA, C.I.E., M.A., M.D. (Cantab.),  
M.R.C.P. (Lond.)

BREVET-COLONEL, I.M.S.

Honorary Physician to H. M. the King

B. SEN, B.Sc., M.B.

and

A. C. ROY, M.Sc.

(From the Department of Pharmacology, School of Tropical Medicine, Calcutta)

THE disadvantage of treating malignant tertian malaria with quinine or atabrin alone is

(Continued from previous column)

(8) <i>Bact. lunavensis</i>	..	1
(9) " <i>metalkaligenes</i>	..	1
(10) " <i>douglasi</i>	..	1
(11) " <i>paratyphosum</i>	..	1
(12) " <i>pritzitzi</i>	..	1

Late lactose fermenters—

(1) <i>Bact. belfastiensis</i>	..	1
(2) " <i>metadysentericum</i>	..	2

Others—

(1) <i>Strept. faecalis</i>	..	1
(2) Staphylococci	..	2
(3) Monilia	..	2

### Summary

A series of 80 cases with chronic gastro-intestinal disturbances admitted under the senior author were investigated by radiological examination. Many of them originally had dysentery, which was later complicated with other pathological conditions of the bowels. Symptoms were variable, the chief being abdominal pains, distressing flatulence and irregularity of the bowels, which had lasted for prolonged periods and which were not controlled by ordinary methods of treatment. This is the class of case which often comes under the category of functional or neurasthenic. Nothing but a thorough laboratory and radiological examination could have diagnosed these cases. The commonest cause was stasis and atony in 37.5 per cent in this series. Other causes were pathological appendix, duodenal ulceration, and colitis, in the order of frequency. Thirteen patients showed normal appearance of the gastro-intestinal tract.

It was observed that in patients in whom the appendix still retained the barium meal after 24 hours the organ was not normal. In those in which the meal was still retained after 48 hours the appendix was definitely pathological and many of these cases showed constrictions and concretions. These observations were confirmed in a number of patients after operation.

### REFERENCE

Banerji, L. M., Chopra, R. N., and Ray, P. N. (1936). Amoebiasis and Appendicitis. *Indian Med. Gaz.*, Vol. LXXI, p. 693.

that neither of these drugs has any effect on the viability of the gametocytes of *Plasmodium falciparum*. In fact, the administration of quinine in some cases brings about an increase in the number of crescents in the peripheral blood. The necessity for a drug, possessing crescenticidal properties has therefore been felt for a long time. It was thus a great event when the synthesis of plasmochin was carried out by Schulemann and his co-workers in 1926. The literature regarding the action of this drug is enormous and there is no doubt that it produces a marked and rapid destructive action on the gametocytes of *P. falciparum*.

Knowles and Das Gupta (1931) worked out the minimal lethal dose of plasmochin for the gametocytes of the Indian strains of *P. falciparum*. They have shown that a total dosage of 0.04 gm. to 0.06 gm. of the drug is sufficient to eradicate all the sexual forms from the peripheral blood, even when the infestation is a very heavy one. These conclusions have also been borne out by Clemesha (1933). This dosage should be administered by the mouth, giving 0.01 gm. of the drug twice daily for two to three consecutive days. Within 24 hours of administration of plasmochin the gametocytes swell up and become irregular, the chromatin breaks up by karyorrhexis and the crescent stains very badly. In 48 hours, many of the gametocytes present in the film are almost unrecognizable and they finally disappear from the peripheral circulation.

In the literature, few cases of resistance to plasmochin are on record. In the Carmichael Hospital for Tropical Diseases we have had opportunities of treating and observing carefully a large number of patients with *P. falciparum* infection showing gametocytes in their blood, and we have found that the total dosage of 0.04 gm. of plasmochin as a rule succeeded in eradicating the gametocytes altogether from the peripheral blood, however large their number may be. Only in a few instances was a dosage of 0.06 gm. necessary.

We were therefore somewhat surprised when, in a patient recently admitted under the senior author into the Carmichael Hospital for Tropical Diseases and showing a heavy infection with the sexual forms of *P. falciparum*, the crescents persisted even after administration of 0.095 gm. of plasmochin, and a total of 0.135 gm. had to be given before they disappeared from the peripheral blood. This patient belonged to the series in which we were testing the effect of combined atebirin and plasmochin dragées (Bayer) on the Indian strains of malaria, and the details of this case are as follows:

Case I.—S. M. K., aged 31, was admitted into hospital on 3rd September, 1936, with the history of malarial fever off and on for the last three months. He was emaciated, slightly jaundiced and his spleen was palpable about an inch below the costal margin. Examination of the blood revealed the presence of

malignant tertian rings and crescents. The laboratory findings and treatment are described below:—

Date	Laboratory findings	Treatment
4-9-36	Scanty M. T. rings and crescents.	
7-9-36	Do.	Atebrin 0.1 gm. and plasmochin 0.005 gm., t.d.s.
8-9-36	Crescents	Do.
9-9-36	Do.	Do.
10-9-36	Do.	Do.
11-9-36	Do.	Do.
12-9-36	Scanty crescents	..
13-9-36	Do.	..
14-9-36	Do.	..
15-9-36	Do.	..
16-9-36	Do.	Plasmochin 0.01 gm., b.d
17-9-36	Do.	Plasmochin 0.02 gm., b.d
18-9-36	Nil	..

Laboratory examination.—Aldehyde test—negative; antimony test—undiluted + and diluted (1/10) —; levulose tolerance test—normal before and after treatment with the combined preparation of atebirin and plasmochin; van den Bergh test—direct —, indirect ±, before and after treatment. Stool examination showed the presence of *Trichomonas hominis*, *E. nana* cysts, *Bact. morgani* and *Bact. para-asitacus*.

The drug was administered by the mouth in the form of tablets each containing 0.1 gm. of atebirin and 0.005 gm. of plasmochin three times a day. The results puzzled us a good deal at first. We then started testing the urine for the presence of these drugs in order to see if any absorption was taking place. There was no difficulty in testing the presence of atebirin but we found the detection of plasmochin was not so easy. In a series of cases in which dragées were given, the urine was tested as a routine for the presence of atebirin, and parasites in the peripheral blood were also examined daily with a view to seeing what effect was being produced on them. Our intention in describing these cases is to bring out the fact that the question of absorption and excretion is an important factor in drug therapy and should never be lost sight of in cases where the expected results are not attained. Plasmochin is a toxic drug and as, in the case described, no such symptoms were noticed even with a dose much higher than the ordinary therapeutic dose, it is likely that the normal absorption of the drug was interfered with.

Case II.—A. U. S., aged 16, was admitted into hospital with the history of malarial fever for three months. He was anæmic and slightly emaciated and the breath

sounds were slightly diminished on the back. He gave a history of chronic irregularity of the bowels and occasional attacks of epistaxis. His spleen was tender and palpable about 2½ inches below the costal margin. Examination of the blood revealed the presence of scanty malignant tertian rings.

Date	Malaria parasites	Treatment	REMARKS
21-11-36	Scanty M. T. rings.	Atebrin 0.1 gm. and plasmochin 0.005 gm., t.d.s.	Urine shows no atebrin. No effect on temperature.
22-11-36	Do.	Do.	
23-11-36	Do.	Do.	
24-11-36	Do.	Do.	
25-11-36	Do.	Do.	
26-11-36	Do.	Atebrin 0.1 gm., t.d.s.	Urine: appreciable amounts of atebrin. Do.
27-11-36	Do.	Do.	
28-11-36	Do.	Do.	
29-11-36	Very scanty M. T. rings.	Do.	
30-11-36	No parasites	Do.	
1-12-36	Do.	..	

*Other laboratory findings.*—Hookworm 700 eggs per c.cm.; urobilin present in the urine; van den Bergh indirect +, direct —; R. B. C. 3,300,000; hæmoglobin 62 per cent.

It will be observed that after a full five days' course of the atebrin and plasmochin dragées the asexual forms still persisted and the urine did not show the presence of atebrin. The patient was then put on atebrin by itself to see if the combination was at fault. The drug was detected in his urine in small quantities, and the asexual parasites disappeared from the peripheral circulation. The patient suffered from chronic gastro-intestinal trouble and had hookworm infection. It would appear that whereas the drug from the combination dragées was not absorbed at all in this case, atebrin by itself was absorbed with difficulty.

*Case III.*—K. N., aged 15, was admitted into hospital with the history of malarial fever for five months. He was anæmic, slightly icteroid and his spleen reached the level of the umbilicus. Examination of the blood showed the presence of a moderate infection of benign tertian malaria.

Date	Malaria parasites	Treatment	REMARKS
25-11-36	B. T. rings, trophozoites.	Atebrin 0.1 gm. and plasmochin 0.005 gm., t.d.s.	Urine: no atebrin.
26-11-36	Do.	Do.	
27-11-36	Do.	Do.	
28-11-36	B. T. rings, trophozoites, gametocytes—scanty.	Do.	

Date	Malaria parasites	Treatment	REMARKS
29-11-36	B. T. rings, trophozoites—scanty.	Atebrin 0.1 gm. and plasmochin 0.005 gm.	No effect on temperature.
30-11-36	..	..	Urine: no atebrin.
1-12-36	B. T. rings, trophozoites—scanty.	Atebrin 0.1 gm., t.d.s.	Do.
2-12-36	Do.	Do.	Urine: atebrin in small amount.
3-12-36	Do.	Do.	Urine: atebrin in appreciable amount.
4-12-36	No parasites	Do.	Do.
5-12-36	Do.	Do.	Do.
7-12-36	Do.	..	Do.

*Other laboratory findings.*—Hookworm less than 100 eggs per c.cm.; urobilin present in urine; van den Bergh indirect +, direct —; Widal: typhoid (H) 25, paratyphoid A (H) + 50; Wassermann reaction moderately positive.

In this patient the usual doses of atebrin and plasmochin in the form of dragées had no effect on the parasites in the blood. No atebrin could be detected in the urine. Even after administration of atebrin alone the absorption of the drug, as judged from excretion in urine, was slight at first. The patient had light hookworm infection and was anæmic.

*Case IV.*—G. A. G., aged 29, was admitted with the history of malarial fever for two weeks. He suffered from an attack of enteric fever in 1923; his liver was tender, the spleen was palpable about half an inch below the costal margin and a few moist sounds were also audible at the back of the lungs. Examination of the blood showed a scanty malignant tertian infection.

Date	Malaria parasites	Treatment	REMARKS
8-10-36	Scanty M. T. rings.	Atebrin 0.1 gm. and plasmochin 0.005 gm., t.d.s.	Urine: no atebrin.
9-10-36	No parasites	Do.	
10-10-36	Do.	Do.	
11-10-36	Do.	Do.	
12-10-36	Do.	Do.	
13-10-36	Very scanty B. T., growing trophozoites.	..	Urine: appreciable amount of atebrin.
14-10-36			
15-10-36			
18-10-36	B. T. rings, growing trophozoites.	Atebrin 0.1 gm., t.d.s.	
19-10-36	Do. scanty	Do.	
20-10-36	Do.	Do.	
21-10-36	No parasites	Do.	
22-10-36	Do.	Do.	

*Other laboratory findings.*—R. B. C. 3,490,000; hæmoglobin 70 per cent; Wassermann reaction strongly positive; van den Bergh: indirect—faintly positive, direct—negative.

This patient did not show any gastro-intestinal trouble, yet no atebtrin was detected in the urine after administration of the combined dragées for five days. But when plain atebtrin was started the urine showed appreciable amounts of the drug.

*Case V.*—S. C. S., aged 37, was admitted with the history of an attack of malaria about two months back. Eleven days after admission into the hospital, the patient started getting fever and, on examination of his blood, a fair number of malignant tertian rings was found. He was suffering from palpitation and difficulty of breathing and gave a history of occasional attacks of hæmatemesis. His spleen was just palpable.

Date	Malaria parasites	Treatment	REMARKS
3-11-36	M. T. rings	Atebrin 0.1 gm. and plasmochin 0.005 gm., t.d.s.	
4-11-36	Do.	Do.	No effect on temperature. Urine: trace of atebtrin.
5-11-36	Do.	Atebrin 0.1 gm., t.d.s.	
6-11-36	Do.	Do.	
7-11-36	Very scanty M. T. rings (thick film).	Do.	
8-11-36	No parasites.		

*Other laboratory findings.*—Hookworm, 3,800 eggs per c.cm.; *E. nana* cysts in stools; urobilin present in urine; van den Bergh: indirect +, direct—.

This patient suffered from a moderate infection with hookworm and showed no atebtrin in the urine after administration of the combined dragées for two days. Atebrin by itself was absorbed with difficulty, as only traces were found in the urine, but the parasites disappeared from the peripheral blood on the fourth day.

*Case VI.*—N., aged 26, gave history of fever for six days only. Blood showed benign tertian infection. He gave a history of chronic constipation.

Date	Malaria parasites	Treatment	REMARKS
25-10-36	B. T. rings, growing trophozoites and schizonts.	Atebrin 0.1 gm. and plasmochin 0.005 gm., b.d.	
26-10-36	Do.	Do.	No effect on temperature.
27-10-36	Do.	Do.	
28-10-36	Do.	Quinine.	
29-10-36	Scanty B. T. rings, growing trophozoites.	Do.	
30-10-36	No parasites	Do.	
31-10-36	Do.	Do.	Urine: no atebtrin.
1-11-36	Do.	Do.	
3-11-36	Do.	..	
4-11-36	Do.	..	Do.

*Other laboratory findings.*—*Bact. pseudo-carolinus* and *Ps. pyocyanea* present.

In this patient the combination dragées had no effect and administration of quinine caused disappearance of the parasites and symptoms were controlled. No atebtrin could be detected in the urine. The stools of the patient showed the presence of organisms of the metadysentery group. This is the class of case in which the gastric acidity is usually low and the meal rushes through the small intestine.

*Case VII.*—H., aged 30, was admitted with the history of malaria—off and on—for three years. He was treated outside with quinine, esanofele, etc., but without much effect. His spleen was just palpable and blood showed scanty benign tertian infection.

Date	Malaria parasites	Treatment	REMARKS
	B. T. rings and growing trophozoites—scanty.	Atebrin 0.1 gm. and plasmochin 0.005 gm., t.d.s.	
	Do.	Do.	Urine: atebtrin a trace.
	Do.	Do.	Urine: no atebtrin.
	Do.	Do.	Urine: just a trace of atebtrin.
	Do.	Do.	

*Other laboratory findings.*—*Trichomonas hominis* and *Bact. pseudo-carolinus*.

In this patient, after administration of combination dragées, only a minute trace of atebtrin could be detected in the urine and the parasites and symptoms persisted. The stools showed the presence of organisms of the metadysentery group. It is the class of case in which the meal rushes through the intestine and the urine only shows a trace of atebtrin when it was given either in the form of combination dragées or by itself.

### Discussion

Variations in the effectiveness of drugs and relative resistance of certain strains of malarial parasites have been frequently reported. What we wish to show, by describing these cases, is that absorption and excretion of drugs are important factors and should not be lost sight of when expected results are not forthcoming. The same drug, given to two different patients under similar conditions for the same symptoms, has behaved entirely differently, and, on testing the urine, one showed the presence of the drug while the other did not.

The reason of this variability in absorption is not far to seek. An analysis of the records of patients admitted into the Carmichael Hospital for Tropical Diseases during the year 1935 shows that in as many as 60 per cent of the patients the gastro-intestinal tract was involved.

Detailed investigation with the help of laboratory and x-ray examinations brought out the fact that approximately 26 per cent suffered from helminthic infections, 28 per cent from catarrhal conditions of the intestines of various origin and the remaining patients from pathological appendix, gastro-duodenal ulcer, pathological gall-bladder, etc. Helminthic parasites, especially hookworm, live in the upper part of the small intestine and a heavy infection may alter the normal physiological processes of absorption in this part (cases II and V). In addition, a large number of patients complained of vague abdominal symptoms without showing any definite laboratory findings for known infective agents. Most of these patients showed a condition of hypo- or hyper-chlorhydria which is very commonly associated with chronic dysenteries and colitis in which the original causal agent, either bacterial or protozoal, is very difficult to detect. The acidity of the stomach is in itself a factor in the absorption of the drug inasmuch as it is often here that the drug is rendered suitable for absorption by disintegration of tablets and conversion of insoluble into soluble compounds.

Another important factor which should not be lost sight of is that the rapid passage of the drug through the small intestine, where absorption of a drug usually takes place, occurs in chronic diarrhoeas and dysenteries. X-ray examinations by barium meal show that the meal in these cases hurriedly passes through the small intestine and in a few hours, less than five usually, it reaches the pelvic colon, not a trace being left in the small intestines. The drug is thus not allowed time for absorption. Besides these conditions, the mucous membrane of the gastro-intestinal tract is not quite normal in a large percentage of patients in the tropics and peptic ulcers, pathological gall-bladder and appendix are frequently met with. The absorption of drugs in such cases may not be normal.

### Summary

The following factors may be responsible for the variability in the absorption of drugs from the gastro-intestinal tract and the practitioner in the tropics should bear them in mind when the expected therapeutic results are not obtained :—

(1) The acute or chronic inflammatory condition of the mucous membrane. It is well known that under such conditions absorption of drugs is modified.

(2) The rapid passage of the meals through the small intestines generally, and upper part of the small intestine particularly, where absorption of these drugs usually takes place.

(3) The hypo-acidity of the stomach which is often met with in chronic dysenteric infections.

(Continued at foot of next column)

## THE TREATMENT OF PITYRIASIS ROSEA

By P. A. MAPLESTONE, D.S.O., D.Sc., M.B., B.S., D.T.M.  
and

N. C. DEY, L.M.P., L.T.M.

(From the Medical Mycology Inquiry, School of Tropical Medicine, Calcutta, partly financed by the Indian Research Fund Association)

THE aetiology of pityriasis rosea is still unknown and there are several theories as to its cause. The most recent of these is that the disease is caused by a filtrable virus, and as the work described in this paper was undertaken solely with the object of testing this theory it is the only one that will be considered.

Wile (1927), as the result of several years' observation amongst a large body of university students, has produced some facts that suggest that pityriasis rosea is contagious, and after many failures he partially succeeded in transmitting it to himself and three other volunteers. He employed fluid from a blister raised over a typical lesion, in two of the cases it was injected intradermally and in two it was applied to a scarified surface. The eruption produced was very mild and short-lived in every instance but some of the lesions definitely resembled those of pityriasis rosea.

Thomson and Cumings (1931) made a complete pathological investigation of the disease

(Continued from previous column)

(4) Lastly, the drug may be administered in the form of tablets which are not properly constituted. Some of the ingredients used may prevent the disintegration of the tablet before reaching the part where absorption of the drug takes place, and in some cases the tablets may not disintegrate at all and may pass through the gut in an unbroken mass. It is open to question whether the atabrin and plasmochin combination in the dragées used renders the absorption of the individual drugs more difficult. It will be observed that, in a number of cases cited, atabrin was not absorbed when the combination dragées were administered, whereas atabrin in the form of tablets by itself was absorbed.

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and they obtained suggestive positive skin reactions, working on lines similar to those used in the Dick reaction, by the employment of a filtrate of scales from the lesions. They also tried to produce the disease by intradermal injection of blister fluid after Wile's method. Altogether, twenty healthy persons and five with other skin diseases were tried in these two experiments and none of them contracted the disease. In spite of these negative results, after careful consideration of all the facts, these two workers consider that pityriasis rosea has some connection with the exanthemata and is probably caused by a filter-passing virus. They explain their failures on the ground that it is an organism to which the majority of people are refractory, and it is pointed out that Wile's partial successes were achieved by inoculation from cases of unusual severity, which suggests a strain of more than usual virulence.

After a very full discussion of all the theories, old and new, which it is not considered worth repeating here, Lord (1932) came to the conclusion that pityriasis rosea is feebly infectious, the causative organism is unknown and the portal of entry is the herald spot.

There are several skin diseases that are now generally accepted as being caused by filtrable virus and amongst these are molluscum contagiosum and infective warts. Ghosh (1934), in the case of molluscum contagiosum, and Ghosh and Maplestone (1935), in the case of warts, working at the Calcutta School reported favourable results in the treatment of these diseases by injection with filtered carbolic emulsion of material taken from the skin lesions and presumably containing the killed virus. On this account it was decided to try the same form of treatment in pityriasis rosea.

*Method of preparing the lysate.*—A recently-erupted spot of moderate size (1 to 1½ cm. in diameter) is selected and thoroughly cleaned with a mixture of alcohol and ether in equal parts. The spot is then anaesthetized by injection beneath it of 2 per cent novocaine solution. An incision is made with a sharp knife completely surrounding the lesion but care is taken not to involve any healthy skin in the circle. The portion outlined by the incision is dissected out, and the whole depth of the cutis vera is removed along with the epidermis, but care is taken not to include any subcutaneous fat. The wound is closed by one or two horse-hair sutures and an appropriate dressing applied.

The portion of skin is placed in a sterile test tube and weighed by difference, the weight of the empty test tube having first been ascertained. The tissue is washed in normal saline solution and this is poured away to remove as much blood as possible and it is placed in an agate mortar with sterile pumice powder and thoroughly ground up. Normal saline is gradually added during the process until an

amount representing 1 c.cm. of saline to each 10 mgm. of tissue has been added. When the emulsion appears homogeneous it is filtered through a Chamberland L3 candle into a vaccine bottle and an amount of 0.2 per cent formalin\* or 1 per cent carbolic in saline is added, the amount being equal to the amount of the filtrate. After being tested for sterility the filtrate so prepared is used for injection.

*Dosage.*—The initial dose we used was 0.1 c.cm. and this is increased by 0.1 c.cm. for every succeeding dose until a maximum of 0.5 c.cm. has been reached, in the case of adults. For children the same initial dose was given but the maximum was only 3 c.cm. It is probable that larger doses could be given for in one case (no. 14) larger doses were tried to see if they were more efficacious than the smaller ones and no unpleasant reactions were noted but, as they apparently were no better than the smaller doses, they were not repeated in other cases. Injections were given every three or four days if the patients attended regularly; it will be noted in the protocol that this interval was considerably exceeded in some instances, but only because the patients did not come on the proper days. We found no difference in results of treatment whether an auto-lysate or a stock lysate pooled from a number of patients was used.

The particulars of the cases and results of treatment are given in tabular form. Nothing of special interest emerges from these records regarding the aetiological characters of the cases studied. It will be seen that the majority of the patients are older children or young adults, which is the same age incidence as has been noted elsewhere. The males are in great preponderance over the females but this is in no way significant for the numbers of males attending the department are much greater than those of the females. The same thing is found when caste and race are considered for the apparently much greater number of Hindus than of Mohammedans is explained when it is noted that the average attendance of the former for all diseases is about four times that of the latter, and people of European descent are relatively rare in our clinic, which fact accounts for the few persons of this category in our series. From these observations it may be concluded that pityriasis rosea in India shows no epidemiological differences from those seen in other parts of the world where the disease has been studied.

Although no detailed investigation regarding other possible causes of the disease was made the opportunity was taken to examine all of our patients for the presence of fungi in the lesions, because one of the theories of the causation of

\* Formalin was soon given up as it was found very painful, even in the strength of 0.1 per cent in which it was used, whereas 0.5 per cent carbolic is painless, so it is now always employed.

the disease is that it is a fungus infection. Only one of our cases showed any fungus at all and he said he had been suffering with tinea cruris of the groins for many years. Although the fungus theory has few supporters at the present day our results, in a country where all kinds of skin disease from fungal infection flourish, lend strong support to the view that it has nothing to do with the causation of pityriasis rosea.

Pityriasis rosea is a self-limiting disease and it usually disappears spontaneously in six to eight weeks from the first appearance of the herald spot and about four weeks after it has become generalized, though there are a few instances where it persists for months. It is therefore rather difficult to assess with any degree of accuracy the value of our form of treatment. The facts that most of our cases, that had persisted for two months or longer, cleared up fairly rapidly after beginning injections and that about half the cases lasted less than four weeks from the time the herald spot appeared are suggestive that the treatment lessens the duration of the disease. An attempt was made to check our results by means of controls selected at different

times during the investigation; these were given nothing but calamine liniment to apply. Unfortunately none of these controls continued to attend for more than a fortnight although there was no sign of the disease improving. It is probable that they were dissatisfied at not receiving as much attention as the others who were getting injections. Injection treatment is remarkably popular in India and one is repeatedly being asked by patients to employ it for all imaginable diseases, and refusal to do this often causes obvious disappointment and dissatisfaction.

Relapse or a second attack of pityriasis rosea is not common, but it occurred in two of our series. In one the rash returned two months after its apparent cure, and in the other six weeks afterwards. Both these second attacks were generalized from the beginning and there was no herald spot.

It is not claimed that our results are sufficiently definite to prove by specific injections that the disease is caused by a filtrable or other organism, but we do consider they lend strong support to this idea, which is gradually gaining ground amongst dermatologists.

TABLE  
Showing details of cases and their treatment

No.	Age	Sex	Caste *	Site of herald spot	Time herald spot appeared before being seen	DETAILS OF TREATMENT		Duration of treatment in days	Total duration of disease in days	REMARKS
						Date 1935	Dose in c.cm.			
1	28	M.	H.	?	2½ months	11/2 13/2 15/2 18/2	0.1 0.2 0.3 0.4	8	83	Cure.
2	20	M.	M.	Abdomen	20 days	29/4 1/5 4/5 8/5 10/5	0.1 0.2 0.3 0.4 0.5	12	32	Do.
3	17	M.	A.-I.	Back	14 "	1/6 3/6 5/6 8/6	0.1 0.2 0.3 0.4	8	22	Do.
4	35	M.	H.	?	8 "	6/7 8/7 10/7 13/7	0.1 0.2 0.3 0.4	8	16	Do.
5	19	M.	H.	?	3 weeks	18/7 22/7 24/7 27/7	0.1 0.2 0.3 0.4	10	31	Do.
6	60	M.	H.	?	1 month	20/7 24/7 27/7 31/7	0.1 0.2 0.3 0.4	12	42	Improved; ceased attending.

\* H. = Hindu. M. = Mohammedan. A.-I. = Anglo-Indian. I. C. = Indian Christian. All the cases had a generalized eruption when treatment was commenced.

TABLE—contd.

No.	Age	Sex	Caste *	Site of herald spot	Time herald spot appeared before being seen	DETAILS OF TREATMENT		Duration of treatment in days	Total duration of disease in days	REMARKS
						Date 1935	Dose in c.cm.			
7	34	M.	H.	?	15 days	20/7 22/7 24/7 27/7	0.1 0.2 0.3 0.4	8	23	Improved: ceased attending.
8	20	F.	A.-I.	Arm	2 months	25/7 27/7 29/7 31/7 3/8	0.1 0.2 0.3 0.4 0.5	10	70	Cure.
9	12	M.	H.	„	7 days	10/8 14/8 17/8 19/8	0.1 0.2 0.3 0.5	10	17	Do.
10	18	M.	H.	?	15 „	28/8 30/8 2/9 4/9 11/9 17/9	0.2 0.4 0.5 0.5 0.5 0.6	20	35	Attended irregularly, so given larger dose. Cure.
11	22	M.	H.	Arm	20 „	5/9 7/9 9/9 11/9 14/9	0.1 0.2 0.3 0.4 0.5	20	30	Cure.
12	25	M.	H.	Abdomen	10 „	14/9 16/9 18/9 21/9 23/9	0.1 0.2 0.3 0.4 0.5	10	20	Do.
13	..	..	..	2 simultaneous on abdomen.	7 „	30/10 1/11 4/11 7/11	0.1 0.2 0.3 0.5	8	15	Do.
14	30	M.	H.	?	7 „	2/11 4/11 7/11 9/11 12/11 14/11	0.3 0.4 0.6 0.8 0.8 0.8	13	20	Do.
15	21	M.	H.	Back	15 „	2/12 4/12 7/12 9/12 11/12	0.1 0.2 0.3 0.4 0.5	10	25	Do.
16	7	F.	M.	Forearm	2 months	1936 15/4 18/4 20/4 22/4	0.1 0.2 0.3 0.3	8	68	First given salicin three grains twice daily for two months without improvement.
17	37	M.	I. C.	?	10 days	13/4 16/4 20/4 23/4	0.1 0.2 0.3 0.4	11	21	Cure.
18	19	M.	M.	Abdomen	6 „	27/4 29/4 2/5 4/5	0.1 0.2 0.3 0.4	8	18	Do.

\* H = Hindu. M. = Mohammedan. A.-I. = Anglo-Indian. I. C. = Indian Christian. All the cases had a generalized eruption when treatment was commenced.

TABLE—concl'd.

No.	Age	Sex	Caste *	Site of herald spot	Time herald spot appeared before being seen	DETAILS OF TREATMENT		Duration of treatment in days	Total duration of disease in days	REMARKS
						Date 1936	Dose in c.cm.			
19	13	F.	H.	Thigh	15 days	6/5 9/5 12/5 15/5 19/5	0.1 0.2 0.3 0.4 0.5	14	29	Cure.
20	16	M.	H.	Arm	12 "	6/5 9/5 13/5 21/5 23/7 25/7	0.1 0.2 0.3 0.4 0.2 0.4	16	28	Cure. Relapse, cured with two injections.
21	20	F.	H.	Chest	2½ months	16/5 18/5 20/5 27/5 16/6 20/6	0.2 0.3 0.4 0.5 0.5 0.5	12	87	Do.
22	23	M.	M.	Arm Chest	1 month 3 weeks	27/7 29/7 1/8 5/8	0.1 0.2 0.3 0.4	10	40	Cure.
23	9	F.	A.-I.	Abdomen	3 months	8/8 11/8 13/8 15/8 24/8	0.1 0.2 0.3 0.3 0.3	17	107	Do.
24	14	M.	H.	Chest	5 days	12/8 15/8 19/8 22/8 29/8	0.1 0.2 0.3 0.4 0.4	18	23	Do.
25	16	F.	H.	Arm	1 month	2/9 5/9 9/9	0.2 0.2 0.2	8	38	Do.
26	21	M.	H.	Back of wrist.	10 days	16/9 19/9 23/9	0.2 0.3 0.4	8	18	Do.
27	12	F.	H.	Arm	1 month	30/9 7/10 10/10 12/10	0.1 0.2 0.3 0.3	13	43	Do.
28	30	M.	H.	?	12 days	7/10 10/10 12/10	0.1 0.2 0.3	6	18	Do.

\* H = Hindu. M. = Mohammedan. A.-I. = Anglo-Indian. I. C. = Indian Christian. All the cases had a generalized eruption when treatment was commenced.

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## HODGKIN'S DISEASE OF THE PEL-EBSTEIN TYPE: SOME UNUSUAL FINDINGS

By L. EVERARD NAPIER, M.R.C.P. (Lond.)

*Acting Professor of Tropical Medicine*

R. N. CHAUDHURI, M.B. (Cal.)

*Assistant Professor of Tropical Medicine*  
and

P. C. SEN GUPTA, M.B. (Cal.)

*(From the Calcutta School of Tropical Medicine)*

HODGKIN'S DISEASE is not very frequently encountered in this country, though the incidence is probably about the same as it is in England. The following case is reported in some detail as it exhibited unusual features:—

An Anglo-Indian boy, aged 12 years, was admitted to the Carmichael Hospital for Tropical Diseases on the 25th June, 1936, with a history of periodical bouts of fever since September 1935, that is, for nine months.

In October 1935, he was admitted to the Presidency General Hospital and diagnosed clinically as a case of kala-azar. He was given a course of antimony injections; the temperature came down and he was discharged as cured.

Next month he had another attack of fever and was readmitted to the same hospital, but by the time he arrived in the hospital the temperature had already come down. As he was anæmic he was given a course of campolon and discharged about the end of December. The boy kept fairly well during January 1936, but during the next four months he had three bouts of fever and was treated in the railway hospital. As the febrile relapses could not be stopped, he was sent to this hospital.

On admission, the patient was afebrile. He was anæmic, and his complexion was pale and yellow; this was assumed to be due to atabrin he had taken outside. The spleen was enlarged  $1\frac{1}{2}$  inches and liver  $\frac{3}{4}$  inch below the costal margin. There was a functional systolic bruit in the heart. A few glands were palpable in the neck and groins; these were small, discrete and painless. No abnormality was detected in any other system.

After eight days' stay in the hospital he developed fever which gradually increased; the temperature varying from  $102^{\circ}\text{F.}$  to  $104^{\circ}\text{F.}$  The spleen was enlarged 3 inches below the costal margin, and was soft but not tender. The pulse was rapid (140 per minute). He had slight bronchitis. There was no toxæmia. He was given expectant treatment, *viz.* quinine, diaphoretics, digitalis, glucose, etc. The temperature came down by lysis after 18 days.

The boy remained afebrile for the next ten days except for a slight rise in temperature towards the latter part of this period. The spleen rapidly diminished till it was just palpable. In view of the past history and the finding of some suspicious bodies in the spleen puncture smear neostibosan injections were started on the 22nd July; a course of 12 injections (daily) amounting to a total of 2.3 grammes was given.

On the 30th July the patient had another bout of fever, the second since his admission. It was of the same type as the first one and was associated with splenic enlargement and tachycardia; the temperature came down on the thirteenth day. Towards the end of this period he had local inflammation in the throat. The glands in the neck were considerably swollen and tender. In view of the possibility of a generalized streptococcal infection he was given a salicylate mixture and prontosil, together with local treatment for the throat.

This was followed by another period of apyrexia for 13 days with diminution of the spleen; the glands in the neck also subsided considerably.

On the 24th August began the third attack of pyrexia and splenic enlargement. This time definite enlargement of the glands of the neck, especially of the left side, with a few in the axillæ and groins was noticed. Considering the possibility of the condition being Hodgkin's disease of the Pel-Ebstein type, we gave him liquor arsenicalis (2 minims gradually increased to 6 minims) twice a day. As the general condition was low and deep x-ray therapy is not so satisfactory in this type of the disease, this treatment was not given. This attack of fever lasted for 15 days.

He was again afebrile for eight days. The size of the spleen and the glands diminished considerably. Next he had low intermittent fever for 12 days. About this time the boy appeared to show some signs of arsenical intolerance; he was disinclined for food, vomited after his breakfast for three days, and complained of pain in the right leg along the sciatic nerve. Arsenic was stopped and some sodium thiosulphate was given intravenously.

On the 28th September the fourth attack of fever in this hospital started. The spleen, as usual, increased and the glands again enlarged. There was definite evidence of neuritis in the right leg, the pain being intense at times; it was most marked in the sole of the foot and behind the leg. The calf was very tender. The knee-jerk was sluggish. There was no anæsthesia. The present attack lasted for a fortnight when the temperature suddenly dropped to normal. Treatment given during this period was mostly symptomatic and consisted of iodides, analgesics and digitalis. The leg was wrapped in cotton-wool and the foot supported between sandbags.

During the next ten days he had a low irregular temperature. The spleen was again reduced and the glands subsided. The general condition was poor. He became very anæmic. On 16th October he was put on a course of campolon injections—4 c.cm. intramuscularly for five consecutive days. On 21st October he was put on ferrous sulphate, 12 grains daily for 21 days. There was some improvement in the anæmia, but with the next bout of fever coming on the anæmia again became severe.

The temperature gradually went up higher daily; this rise constituted the fifth relapse while in this hospital. His condition was now serious and there was high continuous temperature for several days. The stools and urine were passed in the linen and the abdomen was distended and slightly tender. The spleen was enlarged but the glandular enlargement was not very marked this time. During this period treatment consisted of iron, as stated above, stimulants and nursing. The temperature came down about the twentieth day of this bout and it was normal throughout one day but rose again and assumed an intermittent and then a remittent type. The spleen was reduced to  $1\frac{1}{2}$  inches and the glands were just palpable.

On 17th and 20th he was given mercurochrome intravenously, 1 c.cm. and 2 c.cm. of a 1 per cent solution.

*Physical examination on the 22nd November.*—Very low condition; he had a pale yellow complexion and was very anæmic. He had some shivering. The cervical glands were palpable, small, discrete and not painful. Heart slightly enlarged; a systolic bruit was present. Pulse—140 per minute, soft. Respiration—30. Lungs—a few rhonchi behind.

The abdomen was slightly distended, doughy to the feel, with no fluid, but slightly tender.

Spleen— $1\frac{1}{2}$  inches; liver— $\frac{1}{2}$  inch; his face was puffy and eyelids swollen. Both legs and hands were œdematous. He complained of pain in the right leg, especially of the sole, this was less severe than before. Sensation was markedly diminished, almost lost, in the right foot. Motor power of the right leg was practically lost. Knee-jerks were absent. Plantar reflex was normal in the left and lost in the right foot. Sphincter control was impaired. A few small glands were palpable in the groin. He was quite conscious.

After this the boy went steadily down hill; he lost control of his sphincters, but passed very little urine;

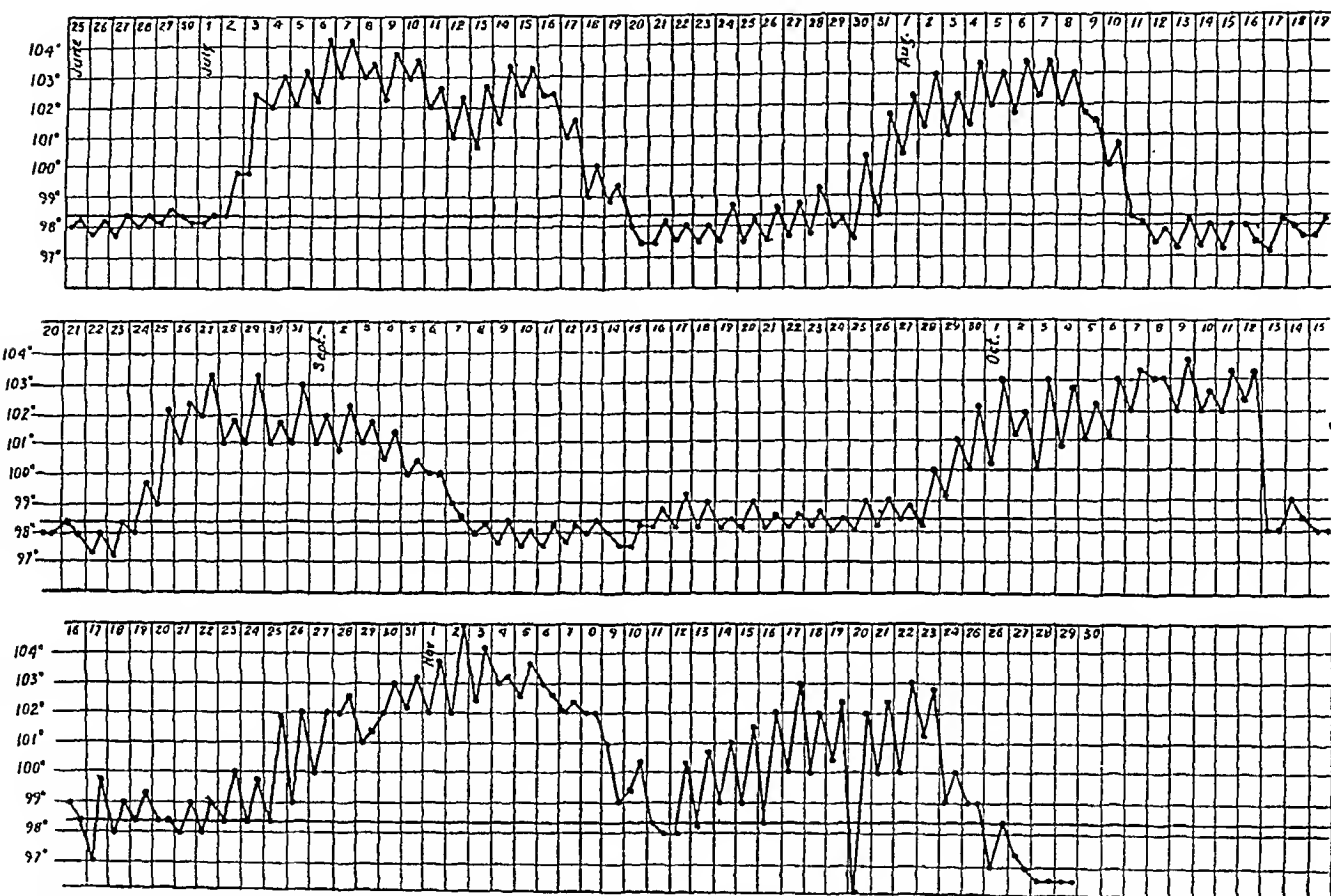
his whole body became puffy. On the 25th evening, the temperature fell; he became very collapsed and scarcely recovered consciousness until his death on the 29th.

A distressing symptom that appeared during the last few weeks of the illness was severe pains all over the body, so the patient dreaded being moved or even touched. This made us disinclined to submit him to any treatment that was not aimed at relieving symptoms.

and its replacement by a vascular tissue consisting of lymphoid cells, fair number of both mononuclear and multinucleate giant cells (so-called Dorothy Reed cells), and fibroblasts (plate III, figures 2 and 3). There are also many swollen reticular cells. Many areas of necrosis and hemorrhage may be found scattered irregularly (plate III, figure 4). Eosinophilic cells which are sometimes found in large number in these glands are not seen here.

# CHART

Temperature chart showing the characteristic Pel-Ebstein type of fever



The question of deep x-ray therapy was frequently considered but not given for this reason, and in view of the poor results that follow in this type of case.

Further blood examination was made difficult by the general anasarca, and, though we were anxious to confirm the diagnosis by removing a gland and sectioning it, we hesitated to subject the boy to this amount of disturbance.

Other than the cytological examinations of the blood, which we report in detail below, numerous laboratory investigations were carried out during the boy's stay in hospital; these included the Wassermann test, protozoal and bacterial blood cultures, agglutination test on three occasions against the typhoid group, melitensis and abortus, and numerous stool examinations; all gave negative results. An x-ray examination of the chest showed increased hilar shadows; the Mantoux test was negative at 1 in 10,000, but higher doses were not tested; a sputum inoculation into a guinea-pig gave a negative result.

A full post-mortem examination was not allowed but a gland was removed at the time of his death and was sectioned.

The report of Professor M. N. De on this gland was as follows:—

'The lymph node is somewhat enlarged and fairly firm. The cut surface appears greyish-white and congested. Histological examination reveals a complete disappearance of the normal structure (plate III, figure 1)

**Blood findings.**—The blood count at different periods is shown in the table. At first there was nothing very characteristic about the blood counts. There was marked and increasing anaemia (intermediate haemoglobin estimations are not recorded in the table) of a more-or-less normocytic type. During the fourth febrile bout a most marked large mononuclear increase was observed. Differential counts were done almost daily between 26th October and 9th November; the large mononuclear count varied from 25 per cent on 27th October, when the temperature curve was rising, to 57 per cent on 3rd and 5th November when it was at its peak.

The large mononuclears were unusual in appearance. Treated by supravital staining methods, most of these cells seemed to be of the histiocyte type. Stained by Leishman's, Giemsa's or Wright's methods they appeared large and vacuolated, the vacuoles often overlapping the nucleus and giving it a moth-eaten appearance. In those blood smears made from oxalated blood (potassium oxalate 0.01 grammé



TABLE  
Blood counts

Date	Hæmoglobin per cent	Red blood cells per c.mm.	White blood cells per c.mm.	Cell volume per cent	Mean corpuscular volume, cu. $\mu$	Mean corpuscular hæmoglobin, $\gamma\gamma$	Mean corpuscular hæmoglobin concentration per cent	DIFFERENTIAL LEUCOCYTE COUNT				van den Bergh indirect
								Polymorphonuclears	Lymphocytes	Large mononuclears	Eosinophils	
26-6-35	68 = 9.35 gm.	4,170,000	5,650	34.88	83.65	22.41	26.86	65	32	1	2	..
9-7-36	56 = 7.7 "	3,190,000	2,100	28.8	92.9	24.8	26.7	58	38	4	0	Negative.
10-8-36	48 = 6.6 "	2,470,000	2,500	20.165	81.64	26.7	32.7	42	54	4	0	Negative.
26-8-36	76 = 10.45 "	3,500,000	5,500	34.97	99.6	29.8	29.9	64	33	3	0	Negative.
12-10-36	38 = 5.225 "	2,080,000	2,200	17.98	86.44	25.12	29.19	45	10	44	1	..
26-10-36	55 = 7.5625 "	3,550,000	4,900	30.52	80.2	21.6	25.2	59	6	35	0	..
9-11-36	22 = 3.025 "	1,680,000	2,750	11.99	70.13	18.0	25.2	49	7	42	2	Positive.
11-11-36	19 = 2.6125 "	1,670,000	1,900	..	..	..	..	56	2	41	1	..

to 5 c.cm. of blood) the vacuoles appeared to be occupied by paired bodies which had the appearance of diplo-bacilli that had not taken the stain; they were shown up best against a coloured background of the cell nucleus, but they were well seen in the cytoplasm in darkly-stained films.

By prolonged staining with Giemsa's stain, they were slightly coloured and a few were seen free, obviously having escaped from cells ruptured during the process of making a smear. They were all the same size—about 2 to 3  $\mu$  by 1  $\mu$ —and, though most abundant in the large mononuclears, were also present in the polymorphonuclear leucocytes, but not in the lymphocytes or other cells.

These paired bodies interested the writers considerably at the time they were first noticed as this was the first case in which they had been seen. The first impression created was that they were some form of crystalline body, but later we considered the possibility that they were intracellular micro-organisms. With this possibility in view, with the assistance of the bacteriological department of the school, we attempted to grow the hypothetical organism from the blood by a number of methods, including culture on liquid and solid medium, of various compositions, in the presence of oxygen, in the presence of CO<sub>2</sub>, and anaerobically, but with consistently negative results. Later, we noticed that the paired bodies were only found in the oxalated specimens of blood and not in the direct smears made at the same time, though the vacuolation in the large mononuclears was still very marked. The bodies were not present in every oxalated specimen and varied in number from day to day (plate III, figures 5, 6 and 7).

This seemed to confirm the first impression regarding the crystalline nature of these bodies. It is interesting that we have not found them before in smears made from oxalated blood, and only on two occasions since; in the blood of an Indian with 'splenomegaly' and in the blood of an Anglo-Indian woman with pernicious anæmia.

*Discussion.*—On the whole, there seems to be little doubt now that these bodies are crystalline in nature and are produced by the action of the potassium oxalate on some substance in the leucocytes, particularly in the vacuoles which were also seen in the non-oxalated specimens. The reaction has been observed in three cases in which there are few common clinical characters, though they were certainly all cases of anæmia. This further suggests that the change in the chemistry of the white cells, whatever it is, is not specific. The possibility of the bodies being living organisms is not entirely negatived, as one could hypothesize an organism being acted upon and made visible by treatment with potassium oxalate.

It is probable that other workers have observed these bodies in the leucocytes in oxalated blood, but so far we have not seen any reference to such a finding in the literature.

Further investigations to determine the nature of these bodies are under consideration.

*Diagnosis.*—The clinical diagnosis of Hodgkin's disease was made mainly by a process of elimination, but its accuracy was frequently doubted by ourselves and questioned by others.

The temperature chart had the appearance of the classical Pel-Ebstein type of the disease, but the glandular enlargement was not marked

(Continued at foot of opposite page)

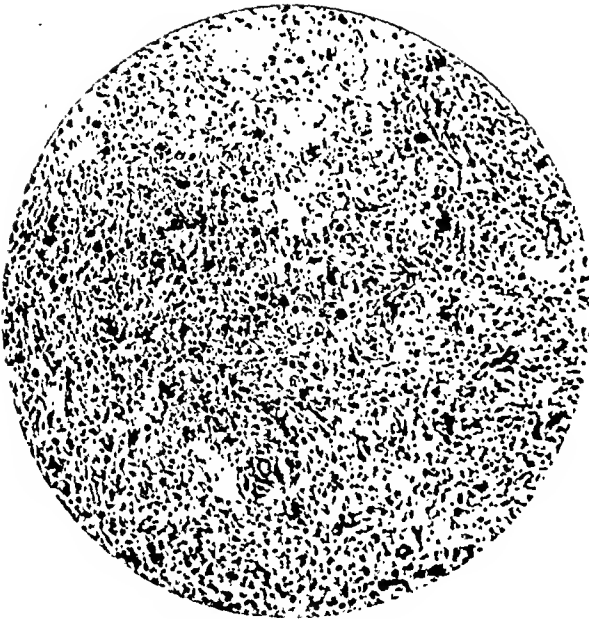


Fig. 1.

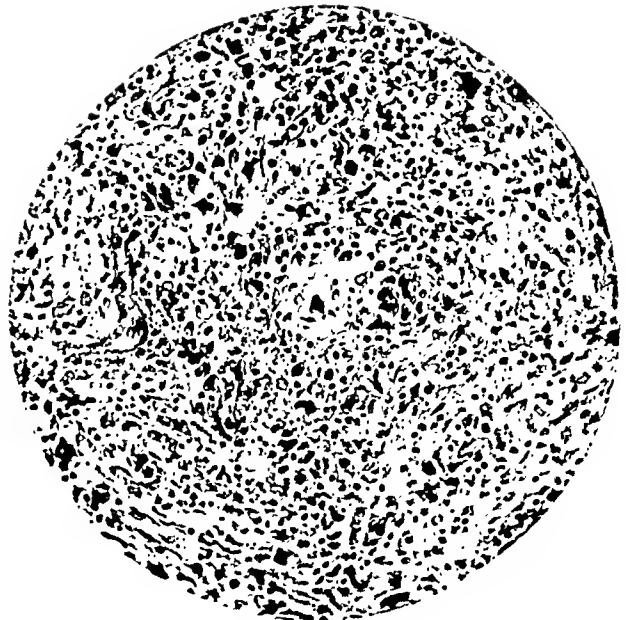


Fig. 2.

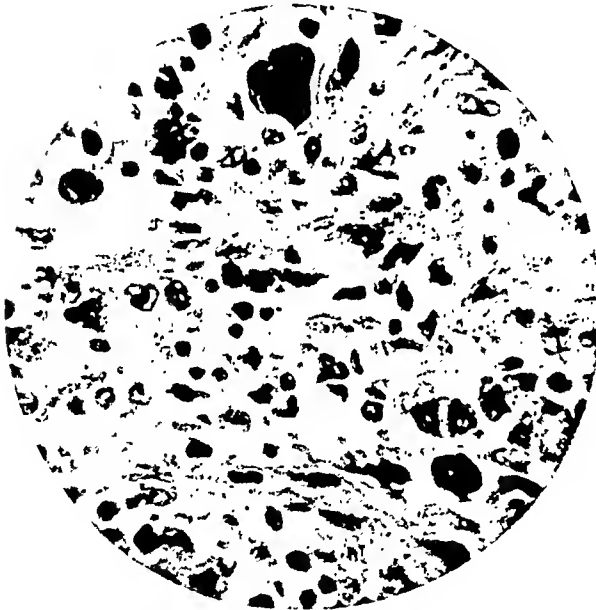


Fig. 3.

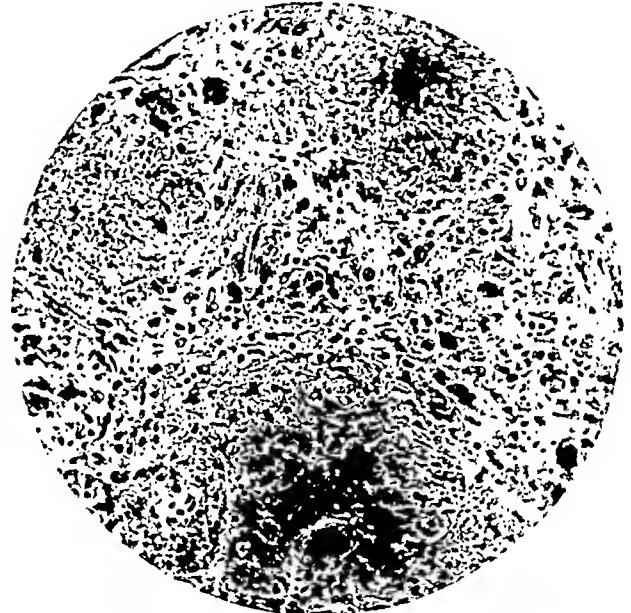


Fig. 4.

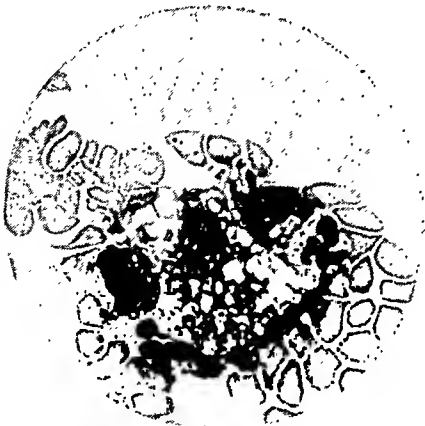


Fig. 5.



Fig. 6.

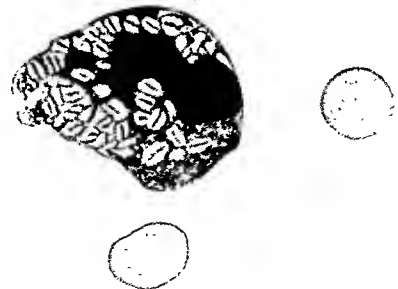


Fig. 7.

Figures 1, 2, 3 and 4 show sections of a lymphatic gland; figures 5 and 6 show the paired bodies in the leucocytes in the 'tail' of a blood smear; and figure 7 is a drawing of a large mononuclear cell containing a large number of these paired bodies.



## A RECORD OF RHINOSPORIDIAL POLYPI WITH SOME OBSERVATIONS ON THE MODE OF INFECTION

By G. S. MANDLIK, M.B., B.S., F.R.F.P.S.

*Honorary Surgeon for the Diseases of the Ear, Nose and Throat, Sassoon Hospitals, Poona*

AFTER the recent publication of 60 cases of rhinosporidiosis by Allen and Dave (1936), this review of my 48 cases collected during the past five years would be of little interest, had it not been for the fact that (1) my cases have been collected from areas of infection which fall in four distinct groups and (2) that a common causal factor of infection is in evidence in all of them.

Ashworth (1923) has concluded that the mode of infection remained undetermined. Allen and Dave (1936) have not been able to discover a common causal source of infection in their 60 cases.

I have tried here to establish, by review and illustrations of case records, that the infection as seen in Poona is 'water-borne'. The cases reviewed are from two districts, Poona and Satara. Two areas of infection have been investigated and the source of infection in the other two is made evident from the review of case records detailed herein.

The first out of the series of my cases in which the rhinosporidium was identified was a polypus removed on 6th February, 1931, from case 1, G. T., a sand-worker.

*Group I, Poona.*—Source of infection: portion of the river Mula-Mutha between the Holkar bridge and the Jamsetji Bund.

(Continued from previous page)

and was evanescent; on some days even the glands in the neck were scarcely noticeably enlarged.

Another clinical feature was the behaviour of the spleen. In the interval between febrile attacks it was usually just palpable; it began to enlarge just before the temperature rose and continued to do so with the utmost precision by half to three-quarters of an inch a day; with the fall of the temperature it again subsided.

The blood picture gave no assistance; the very marked large mononuclear increase is not a common feature of this disease, nor is the low eosinophil count. The diagnosis was, however, confirmed by the histological section of the gland removed at the time of death; in this the picture was typical of the condition.

Our thanks are due to Captain C. L. Pasricha for his advice and the assistance of his department in the bacteriological examinations, and to Professor M. N. De for his report in the sections of the gland and for the four excellent photomicrographs of these sections, over which he took considerable trouble personally.

### *An occupational disease*

During the succeeding two years, *i.e.*, up to February 1933, eight more rhinosporidial tumours were collected. All the men were 'sand-workers' engaged in collecting sand from the river bed. A common causal factor was at once evident. On 26th August, 1932, case 8, A. K., a carpenter, was seen with a rhinosporidial tumour. He was discovered to have been a sand-worker previously. At this time the mode of infection was not unnaturally thought to be in the peculiar type of work in which these men were engaged, that is, that of collecting sand from the river bed. The disease appeared to be an occupational one.

The portion of the river Mula-Mutha used for the collection of sand lies to the north of the city, between Jamsetji Bund two miles from the Sungum, and the village of Dapodi about the same distance from Kirkee. The men work in groups of 4 to 20 in one area, known as a 'plot', for 2 to 8 hours a day, eight months in the year. About 200 men are engaged in the occupation, but not more than a hundred are engaged in one season, the bigger groups being situated between the Bund and the Holkar bridge, a mile and a half from the Sungum up the river.

In order to ascertain the extent of infection amongst the sand-workers commencing on 10th March, 1933, 55 men were examined.

	All cases	Infected
Number examined	55	10
Ages, years	20 to 40	..
Period engaged, years	1 to 14	2 to 7 (except 1)
Hours of work	2 to 6	..
Nature of work—		
Carters	10	..
Divers	45	10
Habits—		
Smokers	23	2
Non-smokers	16	7
Not noted	16	1

In 14 cases other nasal diseases were present and 10 had chronic catarrh; none of the latter group had rhinosporidial infection.

The men were mostly Bhois or Mahrattas, but there were four Kolis (fishermen) who, though engaged in the work all their lives, were not infected.

None of the members of the families of the workers was infected.

Infection rate in the sand-workers is about 1:5.

By the end of the year 1933, 16 tumours had been collected. Case 15, D. I., a farmer, was noticed to have been infected on the work during the first season's diving. Tumours from case 10, C. N. M., a mason, and case 16, S. I., a *mali*, at Yeravada could not however be traced to this occupation, although there was a probability of the infection coming from the same

source, owing to the use these men made of the area for the purpose of bathing and swimming.

*Case 10.*—C. N. M., aged 40, a mason, had a rhinosporidial tumour growing from the left olfactory sulcus which was removed on 10th March, 1933. He had never been a sand-worker, but he bathed and often swam in the river between the Bund and the Sungum. The tumour recurred and was removed again on 18th May, 1934.

*Case 16.*—S. I., aged 30, a mali, rhinosporidial tumour growing from the floor and the left inferior turbinate removed on 6th December, 1933. He was a resident of Belapur and worked as a gardener in a bungalow on the Bund garden road. He was never in the sand-working business, but swam behind his master's bungalow.

*Group II, Manchar.*—Source of infection: tank to the west of the town.

A polypus removed on 8th January, 1934, from case 17, C. B., aged 25, a merchant, from Manchar was the first indication of the existence of the disease in the neighbourhood of Poona.

He also offered the useful information that some more residents of Manchar were similarly affected, and that all of them, including himself, frequently used an old tank in the town for swimming and bathing.

Manchar is situated on the right bank of the Ghodnadi river, about 12 miles north of Khed and 37 miles north of Poona. It is a market town with a population of about 4,000. To the west of the town, beyond a watercourse, is a reservoir about 25 yards square with two flights of steps leading to the water. The west wall has a niche (3 × 2 × 6 feet) with carved side posts and sculptured foliage. Within the niche is a much-worn Devnagari inscription difficult to read. A separate well nearby is reserved for obtaining drinking water.

A brook running north to south, which is nearby, is also used for swimming, when full, in the rainy season.

On 26th January, 1934, at this source of infection I collected three specimens and examined 32 bathers in the tank. The tumours removed were from cases 19, 20 and 21. In all, five cases of rhinosporidial infection were observed, one being an eye infection.

All persons examined were students. The duration of infection was between 1 to 2 years.

Infection amongst the bathers was 1 : 8. All were males.

My thanks are due to Dr. M. G. Bhave, medical officer in charge of the charitable dispensary at Manchar, for permitting me to operate at the dispensary and for the help in conducting the investigation.

*Case 28.*—H. K., aged 23, a merchant, had the rhinosporidial tumour removed on 25th January, 1935. Tumour growing from the floor of the left nostril. Duration of symptoms, one year. Nine months before he had stayed at Manchar for four months. During his stay there he used frequently to swim in the tank.

*Case 38.*—S. G. K., aged 26, a hawker in bangles. Operation on 7th August, 1935, for a rhinosporidial tumour on the floor of the right nostril. He had stayed at Manchar two years ago for three months and used to swim in the tank then. Symptoms of epistaxis for the past six months only. A very vascular tumour had been removed previously elsewhere.

### *A water-borne disease*

It had now become evident that the disease as it appeared in Poona was no longer limited to the sand-workers. Could there not be some factor common to both Poona and the Manchar cases? The sand and the fish as a source of infection, not found in the tank at Manchar, were ruled out. The silt and the mud perhaps, but the water, the stagnant water, certainly was essentially the same in these two places.

The water in the tank at Manchar was stagnant throughout the year, excepting an occasional overflow in the rainy season. The water in the Mutha river beyond the Sungum was dammed across by the Jamsetji Bund about 2 miles down the river. In spite of the sluices in the Bund, silt and sand accumulated in the bed of the river. There was water stagnation to a great extent.

Some cases illustrating the water-borne nature of the infection in the Poona group, in persons other than the sand-workers:—

*Case 33.*—D. N., aged 20, a peon, tumour removed from the right side of the septum on 15th May, 1935; used to swim in the river behind the Maharaja of Kolhapur's bungalow.

*Case 39.*—G. B., aged 17, a potter, bathes in the river above the Sungum and collects mud and earth from the river bed for making bricks. Rhinosporidial tumour removed on 25th September, 1935, from the left side of the septum.

*Case 40.*—B. J., aged 25, a Bhoi, fisherman. Tumour removed from the spur on the right side of the septum on 1st November, 1935. Once removed three years ago. Bathes and swims near Sungum.

*Group III, Satara.*—Source of infection: three tanks in the city, Mangalwar, Machi and the municipal tank.

The suspicion aroused regarding the water-borne nature of the infection was brought a step nearer conviction by the appearance of this group of cases. The first to come under notice was case 22, S. R. K., a student, seen on 20th April, 1934, with a rhinosporidial polypus arising from the floor of the left nostril. Case 24, S. D. G., a teacher from Yawatmal in the Central Provinces, followed on 11th May, 1934. The infection was traced to the source at Satara, which place he often visited during holidays. Case 26, B. J., a clerk, had his polypus removed on 17th October, 1934. Suffered from attacks of epistaxis for three years. He gave a history of exposure to infection at Satara seven years previous to the appearance of the symptoms. Case 22 brought his brother, case 27, D. R. K., also infected at Satara, for operation on 23rd November, 1934, thus completing my first five cases from this group. They were all used to bathing and swimming in one or more of the three infected tanks in that city.

*Case 25.*—N. N., aged 19, rhinosporidial polypus growing from the junction of the septum and olfactory sulcus, left side. Operation on 15th June, 1934. Till last year bathed in Phutka tank, now bathes in the municipal tank, Satara.

Case 26.—B. J., aged 25, a clerk. Growth in the right nostril growing from the olfactory sulcus. Presence of the growth noticed for one month. Exposed to infection one year ago. Previously once operated on for epistaxis, three years previously a vascular growth had been removed. He had been exposed to infection seven years before. Now resident of Poona.

Satara is 69 miles by road to the south of Poona, situated on a slope below a range of hills which form a semicircular girdle round a

Case 45.—B. S., aged 22, a goldsmith, rhinosporidial growth in nose removed on 12th June, 1936. He visits Oundh every two or three months, and swims in the tank whenever he visits Oundh. He also visits Satara and used the Mangalwar tank a year ago once. He is a resident of Poona but never bathes in the Sungum area.

#### Summary of the case records

Forty-eight cases examined and treated from 6th February, 1931, to 25th October, 1936.

TABLE

Number of the group	..	..	..	I	II	III	IV	TOTAL
Name of the group	..	..	..	Poona	Manchar	Satara	Oundh and Yelliv.	..
Place of infection	..	..	..	River Mula-Mutha, near Sungum.	Tank west of the city.	Three tanks	Old wells	..
Number in each group	..	..	..	25	8	12	3	48
Site of infection—								
Olfactory sulcus	..	..	..	5	..	2	..	7
Septum	..	..	..	4	4	3	..	11
Floor of nose	..	..	..	1	3	2	1	7
Turbinal bones	..	..	..	3	..	5	1	9
Not mentioned	..	..	..	12	1	..	1	14
Pathological diagnosis	..	..	..	20	8	11	3	42
Clinical diagnosis	..	..	..	5	..	1	..	6
Occupation—								
Sand-workers	..	..	..	18	..	..	..	18
Students	..	..	..	..	5	6	1	12
Others	..	..	..	6	3	5	2	16
Not known	..	..	..	1	..	1	..	2

REMARKS.—The duration of the disease was up to seven years. The symptoms appeared from within a year to several years after exposure to infection. All persons infected were males.

recess, with the fort on the south and the Yawateshwar hills on the west. All drainage goes to the Yenna on the north by means of brooks rising from the hills on three sides. The city has several wells and tanks. Many of the tanks have now dried up. The three tanks to which the infection is traceable are constantly in use for the purpose of bathing and swimming, particularly in the hot weather.

The largest and the oldest is the Mangalwar or Shripat tank to the west of the city. The Phutka talao is in Machi peth near the foot of the hills and the municipal tank in Bhavani peth, though smaller, is very popular. The students in particular use this, because it is near the school and more central. The extent of infection in the swimming population was not investigated, but from the survey of cases the source of infection can be quite definitely traced to these tanks.

Group IV, Oundh and Yelliv.—Source of infection: old wells in the respective places.

In order to complete the record, three cases are included in this group provisionally, case 13 seen on 30th June, 1933, from Khamgaon in Bhimthadi subdivision. The village has not been traced and is included in this group for convenience.

Case 44.—K. A. G., aged 16, a student, rhinosporidial growth removed on 18th March, 1936, from right inferior turbinate. History of swimming in old well in the village of Yelliv and a tank at Oundh. He knows of some more persons with such growths using the well and the tank.

#### Outstanding signs, symptoms and treatment

Epistaxis, the presence of a strawberry red growth, and nasal obstruction are the three outstanding symptoms. When the tumour is deep in the nose, epistaxis is the first symptom. Obstruction is usually the last. The sand-workers complain of inability to remain under water long enough, even with very small growths. Unlike ordinary nasal polypi these growths never cause a 'frog-nose'. Sessile growths have often a linear attachment of a mucous fold from which they grow into the cavity of the nose. Treatment is surgical. The knife is used after localizing the attachment. Allen has tried neostibosan with variable results. A rapid diagnosis is arrived at by dropping the polypus in Zenker's fluid; hundreds of tiny leaflets stand out from the surface of the polypus in a few minutes, the red colour changing to ash-grey.

#### Conclusions

In the cases so far recorded from elsewhere no common cause of infection has been noted. From the review of cases recorded here it is clear:—

(i) that the rhinosporidial infection in Poona and the neighbourhood is localized to areas divisible into groups,

(ii) that the infection in these groups is localized to infected water of the wells, tanks, or an infected section in the course of a river,



## APPENDIX I

*List of rhinosporidial polypi removed from 6th February, 1931, to 25th September, 1936*

Serial number	Identification, religion and age	Date of operation	Pathological report	Situation	Group	Occupation	Duration, years	REMARKS
				1931				
1	G. T. (H.), ..	6th Feb.	Positive	..	I	S. W.	..	
2	N. K. (H.), 35	25th Nov.	"	..	I	Farmer	..	Former S. W.
				1932				
3	S. I. (M.), ..	10th June	Clinical	..	I	S. W.	..	..
4	M. Y. (H.), ..	17th "	Positive	..	I	"	..	..
5	B. K. (H.), ..	15th July	"	Both nostrils	I	"	..	Rec. 22-8-32.
6	S. V. (H.), 20	5th Aug.	"	"	I	"	..	..
7	N. Y. (H.), 30	19th "	Clinical	..	I	"	..	..
8	A. K. (M.), 40	26th "	Positive	Right nostril	I	Carpenter	..	Once a S. W.
				1933				
9	H. Y. (H.), 25	8th Feb.	Positive	Lt. septum, rt. floor.	I	S. W.	..	..
10	C. N. M. (M.), 40	10th Mar.	"	Lt. olf. sulcus	I	Mason	2	..
11	M. A. (H.), 27	24th "	"	Rt. nostril	I	S. W.	..	Rec. 18-5-34.
12	B. K. (H.), 16	16th June	"	Both nostrils	I	"	..	..
13	K. R. (H.), 32	30th "	"	Rt. floor	IV	Farmer	2	..
14	D. H. (H.), 25	12th July	"	Both nostrils, olf. sulcus.	I	S. W.	1	..
15	D. I. (H.), 20	30th Nov.	"	Lt. olf. sulcus	I	Farmer	9/12	Once S. W., now Dahiwadi.
16	S. I. (H.), 30	6th Dec.	"	Lt. inf. turb. and floor.	I	Mali	5/12	..
				1934				
17	C. B. (M.), 25	8th Jan.	Positive	..	II	Merchant	..	..
18	N. K. (H.), 30	10th "	Clinical	Olf. sulc.	I	S. W.	..	..
19	B. M. (M.), 14	26th "	Positive	Rt. floor	II	Student	1	Epistaxis.
20	B. M. A. (M.), 12	26th "	"	Junct. rt. sept. and floor.	II	"	..	Growing backwards.
21	B. K. (H.), 17	26th "	"	Junct. lt. sept. and floor.	II	"	2	Epistaxis.
22	S. R. K. (H.), 21	20th April	"	Lt. floor	III	"	..	Brother of no. 27.
23	B. P. (H.), 25	27th "	"	..	I	S. W.	..	..
24	S. D. G. (H.), 38	11th May	"	Rt. inf. turb.	III	Teacher	3	..
25	N. N. (H.), 19	15th June	"	Junct. sept. and olf. sulc.	III	Student	2/12	Both tanks.
26	B. J. (H.), 25	17th Oct.	"	Rt. olf. sulc.	III	Clerk	1/12	Epistaxis, expose. 10 yrs.
27	D. R. K. (H.), 18	23rd Nov.	"	Lt. floor	III	Student	..	..
				1935				
28	H. K. (H.), 23	25th Jan.	Positive	Lt. floor	II	Merchant	..	..
29	P. D. M. (H.), 25	22nd Feb.	"	Lt. med. turb.	III	Student	2	Epistaxis, 1½ yrs.
30	B. K. J. (H.), 26	1st Mar.	"	Rt. olf. sulc.	III	"	..	..
31	V. R. (H.), 18	10th April	"	Lt. sept. ant. end	II	"	1/12	..
32	H. M. H. (H.), 15	1st May	"	Rt. septum	II	"	..	Once pulled in childhood.
33	D. N. (H.), 20	15th "	"	Lt. "	I	Peon	1	..
34	N. K. R. (H.), 40	19th June	"	Lt. nostril	I	S. W.	7	..
35	A. R. G. (H.), 24	21st "	"	Lt. inf. turb.	III	"	..	..
36	A. G. (H.), 16	19th July	"	Lt. olf. sulc.	I	S. W.	..	Removed 3 yrs. ago, rec.
37	S. G. D. (H.), 44	26th "	"	Spur on sept. lt.	III	Pr. service	3	Epistaxis.
38	S. G. K. (H.), 26	7th Aug.	"	Floor	II	Hawker	..	Choking, epis-taxis.
39	G. B. (H.), 17	25th Sept	"	Septum lt.	I	Potter	7/12	..
40	B. J. (H.), 25	1st Nov.	"	Spur sept. rt.	I	Fisherman	4	..
				1936				
41	B. R. (H.), 25	24th Jan.	Positive	Ant. end lt. inf. turb.	III	Merchant	..	Six times re-moved.
42	K. V. R. (H.), 25	31st "	"	Ethm. region under mid turb.	III	Med. student.	..	Spider-like.
43	D. N. (H.), 20	6th Mar.	"	Rt. sept. eroding	I	Pr. service	3	Rec. swims.
44	K. A. G. (H.), 16	18th "	"	Rt. inf. turb.	IV	Student	5/12	..
45	B. S. (H.), 22	12th June	"	..	IV	Goldsmith	..	..
46	I. S. (M.), 18	4th July	Clinical	..	I	S. W.	..	..
47	B. J. K. (H.), 20	22nd "	"	..	I	"	..	..
48	S. V. (H.), 22	25th Oct.	"	Rt. septum.	III	Pr. service	4	..

S. W. = Sand-worker. Rec. = Recurrence.

(iii) that the infection is transmitted in the process of bathing, swimming or diving, and (iv) that the part played by the fish or other aquatic hosts, if any, is not certain, but the sand and the silt probably help the process of transmission.

Ashworth (1923) refers to direct transmission of discharged spores as an obvious method by which the infection could be spread from man to man. It is here suggested that the spread takes place through the medium of water, possibly stagnant water.

Spores in the trophic stage with a stout chitinous envelope have been known to exist in the epidermal layer, probably having thrust their way through from the subjacent connective tissue. It is possible to imagine that such spores floating in the infected water similarly find their way into the epidermal layer from without.

The fact that the carters engaged on the sand work are not infected suggests that mere bathing in infected water is not enough. Swimming, which ensures frequent and more prolonged contact with the spores, and diving, which presses the spores against the nasal mucosa by virtue of the force of the dive and the increased water pressure, are necessary for a successful graft or anchoring of the spores. It may even be possible that this force drives the spores through the mucosa from without in the same way as the increased lymph pressure in the connective tissue has been suggested to thrust them from within. The spores are non-motile, and some such external force would seem necessary.

Whether the spores in infected water remain in the trophic stage or whether a flagellate stage exists is not known, nor is it yet certain whether the sporangium is parasitic in any of the aquatic species.

The occurrence of infection in persons exposed to infection varies within a wide range. A few contract the infection within the first year, but the majority appear to resist infection over a period of some years.

Catarrhal and suppurative conditions of the nasal cavity would seem (from group I) to resist infection, possibly on account of the phagocytic action of the inflammatory cells present in the tissues under the mucosa, in such affections of the nose.

R. E. Wright in 1922 suggested the possibility of the transmission of the organism through water, but his cases did not reveal any such common cause. In the cases recorded and grouped as above, a common cause for such a mode of transmission is made evident for the first time.

All the examples of rhinosporidium from man studied so far appear to be referable to one species, the systematic position of which, according to Prof. Ashworth, is referable to the

(Continued at foot of next column)

## THE BISULPHITE-BINDING POWER OF THE BLOOD IN CASES OF EPIDEMIC DROPSY, ANÆMIA AND MALARIA AND ITS POSSIBLE BEARING ON A VITAMIN-B DEFICIENCY

By H. ELLIS C. WILSON, M.B., Ch.B., D.Sc.

Professor of Biochemistry and Nutrition

and

B. K. GHOSH, M.Sc.

Department of Biochemistry and Nutrition, The All-India Institute of Hygiene and Public Health, Calcutta

PETERS and SINCLAIR (1933) have shown that in pigeons suffering from vitamin-B<sub>1</sub> deficiency the brain, when incubated with lactic acid, produced pyruvic acid in appreciable amount whereas when the brain of normal control birds is substituted this is not produced. Peters and Thompson (1934) further showed that pyruvic acid is probably a normal intermediary in the course of carbohydrate metabolism. In vitamin-B<sub>1</sub> deficiency the metabolism of carbohydrate appears to be held up at the pyruvic acid stage; this leads to an accumulation of this substance. The exact precursor of pyruvic acid and its normal fate, oxidation or re-synthesis, is at present obscure. The fact however of its appearance in the tissue in this condition is all that need concern us in this preliminary report.

This discovery led to an estimation of pyruvic acid in the blood of pigeons suffering from vitamin-B<sub>1</sub> deficiency. Thompson and Johnson (1935) found the blood pyruvate to be increased from a normal value of 3.46 mg. to 11.31 mg. per cent in affected animals. The method they employed, namely, the bisulphite-binding power (henceforth B.B.P.) is not however specific for pyruvic acid, but Johnson (1936) later isolated pyruvic acid as the 2.4 dinitrophenylhydrazone. Platt and Lu (1936)

(Continued from previous column)

fungus group of the Phycomycetes, suborder Chytridinea, and provisionally near the Olpidiaceae.

It is as yet undetermined whether the organism found in Poona and the neighbourhood, with such strong affinity for water, may not belong to an allied but a separate sub-group of its own.

Compiled from my notes on the cases seen and treated at the Sassoon Hospitals, Poona, and published with the permission of and thanks to the Civil Surgeon, Lieut.-Col. R. H. Candy, I.M.S., Poona.

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in China investigated the B.B.P. of the blood of patients suffering from beri-beri and other conditions and showed that the B.B.P. was increased from a normal figure of 3 to 4 mg. to about 11 mg. per cent in cases showing clinically

bicarbonate, and estimating the released bisulphite by titration with a standard iodine solution.

The data obtained from the five groups of patients and one normal group are given below:

TABLE

GROUP A Normal	GROUP B Malaria without anæmia	GROUP C Anæmia	GROUP D Epidemic dropsy	GROUP E Diabetes	GROUP F Spleno- megaly
3.23	3.39	5.80	8.90	6.2	5.2
3.25	3.51	6.60	8.40	6.3	5.35
3.70	3.70	5.70	8.30	6.9	5.3
2.9	3.60	6.85	8.30	..	..
3.55	3.8	5.90	8.42	..	..
3.66	..	5.10	7.69	..	..
Average 3.38	Average 3.58	Average 5.99	Average 8.33	Average 6.47	Average 5.28

varying degrees of beri-beri. They found, however, that not all the B.B.P. in every cases was due to pyruvic acid, in contrast to the finding in pigeons with experimental vitamin-B deficiency. They suggested that similar observations might be carried out in cases of epidemic dropsy (often called beri-beri in Bengal) which has at times been thought to be associated with a vitamin-B deficiency.

Dr. L. E. Napier, who had seen some of Platt and Lu's work when he visited the Lester Institute at the time of the Far Eastern Association of Tropical Medicine meeting of 1934, drew the writer's attention to Platt and Lu's paper and suggested that, as well as in cases of epidemic dropsy, the test might be carried out on a number of his cases of anæmia and in normal persons of the same class, as it had been shown that vitamin-B deficiency was the cause of a type of macrocytic anæmia that occurred in Bombay (Wills, 1931), and he himself had found that a diet rich in vitamin-B complex effected a cure in certain cases of anæmia in Bengal (Napier, 1936). The majority of the bloods tested in this investigation were from patients of the hospital attached to the Calcutta School of Tropical Medicine, and the necessary clinical data were supplied by him. The cases investigated included epidemic dropsy, anæmia, malaria (without anæmia), splenomegaly, and diabetes. In addition blood from five healthy well-to-do Indians and one European was investigated in order to compare the normal standard B.B.P. of the blood with that obtained by Platt and Lu.

The B.B.P. in the blood was determined by the method of Clift and Cook (1932), so that the results might be comparable with those of Platt and Lu who used the same technique. The essentials of the method consist of forming the bisulphite compound of pyruvic acid, aldehydes or ketones, hydrolyzing it with sodium

It will be noted that the highest average B.B.P. is found in cases of epidemic dropsy. The figure is also considerably increased in cases of anæmia, splenomegaly, and diabetes. The differences between malaria (without anæmia) and the normal are the only ones which are not statistically significant by Fisher's 't' test. We do not, however, lay too much stress on all the results, bearing in mind the fact that the method is not specific for pyruvic acid. In the diabetics, for instance, it is possibly due to traces of acetone in the blood. The fact that most groups of patients show an increased B.B.P. of the blood may be due not so much to the disease itself as possibly to the fact that the hospital class are all suffering from a variable degree of vitamin-B<sub>1</sub> deficiency. It would appear, however, that in the cases of epidemic dropsy and anæmia there is an unmistakable increase in the B.B.P. of the blood. This may be due to the presence of some substance or substances, pyruvates, methylglyoxal or aldehydes, which are increased in the blood in these conditions. Previous work in this laboratory has shown that the blood uric acid in epidemic dropsy, as estimated by the arseno-phosphotungstic acid reagent of Benedict and Franke (1922), is increased. We tested a solution of pyruvic acid which probably contained allied substances usually found in association with pyruvic acid, and observed that it gave a slight colour with the uric acid reagent. It would then tend to confirm the observation that there is some substance or substances present in abnormal amount in the blood in epidemic dropsy. This substance combines with bisulphite and possibly reacts to a certain degree with the arseno-phosphotungstic reagent.

Further work will have to be done in order to find out whether it is due primarily to pyruvic acid, methylglyoxal or some other substance. Whether our findings indicate a deficiency of vitamin B<sub>1</sub> or an allied vitamin cannot

be stated at present. It should be pointed out again that Platt and Lu found that in many cases the total B.B.P. of the blood of beri-beri patients could not be accounted for entirely as pyruvic acid, in contrast to the findings in experimental beri-beri. It is possible that epidemic dropsy and some of the anæmias may be associated with partial deficiency of this vitamin or its imperfect absorption and/or utilization in the tissues. It is proposed to take up the question of the vitamin-B<sub>1</sub> excretion and saturation of patients in order to obtain more information on this point.

In regard to the anæmias it is premature to make definite statements. The increase in the B.B.P. of the blood, although much less than in the cases of epidemic dropsy, was nevertheless nearly double the normal value. In view of the fact, however, that some of the anæmias in this country can be cured by a good diet (Napier, 1937) or by protective foods, such as marmite (Wills, 1931), which is rich in all the vitamins of B group, the findings recorded here are of interest. At the present time some six different factors have been obtained from yeast; some are necessary for man, others for rats or birds. It is possible that all—in varying proportion for the different species—are necessary for normal health. The incidence and clinical expression of a deficiency may vary according to the relative proportion of the different factors of the B group in the dietaries concerned. This conception is not new, in view of the fact that there is a certain amount of evidence for the existence of more than one form of vitamins A and D.

### Conclusions

1. The bisulphite-binding power is increased in the blood of cases of epidemic dropsy, anæmia, splenomegaly and diabetes.

2. The significance of those findings in relation to a vitamin-B<sub>1</sub> deficiency is discussed.

3. The possibility that different deficiency diseases may be due to the relative lack of one of the several components of the vitamin-B complex is discussed.

We desire to acknowledge the help of Mr. Swarup for checking the statistical data.

### Protocol on the statistical treatment of the figures

In order to find out if the differences in the five groups are significant when compared to the normal, group A, Fisher's 't' test has been applied, viz :—

$$t = \frac{(\bar{x}_a - \bar{x}_i)}{\sqrt{\frac{1}{N_a} + \frac{1}{N_i}}}$$

(Continued at foot of next column)

## THE EGGS OF *TÆNIA SOLIUM* AND *TÆNIA SAGINATA*

By P. A. MAPLESTONE, D.S.O., D.Sc., M.B., B.S., D.T.M.  
(From the Helminthological Research Laboratory,  
School of Tropical Medicine, Calcutta)

IN a recent search of the literature for records of *T. solium* in India several papers were found in which infection with this parasite was distinguished from that of *T. saginata* by stool examination when only eggs were seen.

The generally accepted teaching is that *T. solium* eggs are globular and *T. saginata*

(Continued from previous column)

where  $\bar{x}_a$  denotes the mean of the normal group.

$\bar{x}_i$  denotes the mean of any other group (i varying over groups).

s is the pooled estimate of the variance obtained from the following formula :—

$$s^2 = \frac{S_a (x_a - \bar{x}_a)^2 + S_i (x_i - \bar{x}_i)^2}{(N_a - 1) + (N_i - 1)}$$

where  $N_a$  denotes number of observations in the normal group.

$N_i$  denotes number of observations in the other group.

The value of 't' taken in conjunction with the degrees of freedom (two less the number of observations of both groups) will show from statistical tables whether the difference is significant in each case.

Groups	't'	Degrees of freedom	
A and B	1.2903	9	Not significant.
A and C	9.0218	10	Significant.
A and D	24.324	10	"
A and E	13.205	7	"
A and F	10.1442	7	"

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eggs are oval; how general is this idea may be gathered from the table below, which has been compiled from a fairly comprehensive list of standard books dealing with parasitology.

A gravid segment from a *T. solium* and a similar one from a *T. saginata*, both of which had been identified by examination of other gravid segments, and the heads were dissected

TABLE

Author and book title	<i>T. solium</i> *	Remarks	<i>T. saginata</i> *	Remarks
Neumann and Meyer. <i>Lehman's Medizinische Atlanten</i> . 1914.	31-36	Round	30-40 × 20-30	Oval.
Stephens, Fantham and Theobald. <i>Animal Parasites of Man</i> . 1916.	31-36	Globular	30-40 × 20-30	Do.
Castellani and Chalmers. <i>Manual of Tropical Medicine</i> . 1919.	31-38	Do.	30-40 × 20-30	Do.
Rivas. <i>Human Parasitology</i> . 1920 ..	31-38	Almost spheric	30-40 × 20-30	Somewhat larger and oval.
Byam and Archibald. <i>Practice of Medicine in the Tropics</i> . 1923.	31-36	..	30-50 × 20-30	..
Baylis. <i>Helminthology, Medical and Veterinary</i> . 1929.	31-36	..	30-50 × 20-30	..
Faust. <i>Human Helminthology</i> . 1930 ..	31-38	Spherical or sub-spherical.	30-40 × 20-30	..
Brumpt and Neveu-Lemaire. <i>Travaux Pratique de Parasitologie</i> . 1933.	31-56	Globular	30-40 × 20-30	Ovoid.
Mönnig. <i>Veterinary Helminthology and Entomology</i> . 1934.	42	Spherical, rarely ovoid.	45-48 × 43-45	Ovoid, rarely spherical.
Manson-Bahr. <i>Manson's Tropical Medicine</i> . 10th ed. 1935.	31-56	Globular or slightly oval.	30-40 × 20-30	More or less globular.
Chandler. <i>Introduction to Human Parasitology</i> . 5th ed. 1936.	35-42	Rarely spherical	30-45 × 20-30	More oval than solium.
Brumpt. <i>Précis de Parasitologie</i> . 5th ed. 1936.	31-56	Globular	30-40 × 20-30	Ovoid.

\* All measurements in microns.

With the exception of Mönnig in the above list of authors it can be reasonably inferred that the measurements of the eggs of these two species of tapeworm have been copied from book to book without any attempt to confirm the particulars given. In the literature available it is not possible to find who first published the statements but at least they date from 1908, the fourth edition of Braun's 'Die Tierschen Parasiten des Menschen', for it is from this that much of 'The Animal Parasites of Man' by Stephens, Fantham and Theobald was translated.

Two other books, Southwell (1930) and Blacklock and Southwell (1935), have not been included in the above list because they make the revolutionary statement that the eggs of these two parasites are indistinguishable. When it is noted that the first of these two books appeared in 1930 and that five of the books cited above were published three or more years later it seems that Southwell's statement has been missed by the authors concerned or it is disbelieved and has therefore been ignored. As far as the writer is aware Southwell has never published any detailed observations to prove his remark so it is possible this is why it has not been referred to in other works. It is with the object of emphasizing and drawing attention to what is an important correction in a practically universally held belief that the following small research has been carried out.

and a number of the eggs placed on slides in water. One hundred eggs, taken as they appeared in the microscopic field and without selection, were measured in two diameters, the longest and shortest. Both worms had been in formalin for a year or two, but this is of no importance as tapeworm eggs remain unaltered indefinitely, in properly preserved material. The eggs were measured under a one-sixth objective combined with an eyepiece micrometer that gave a total magnification of approximately 300 diameters. Each division of the micrometer was  $3.9 \mu$ , and in measuring the eggs differences of approximately  $1 \mu$  were recorded by estimating, when both edges of an egg did not coincide with two of the scale divisions, whether it extended for  $\frac{1}{4}$ ,  $\frac{1}{2}$  or  $\frac{3}{4}$  of a division. In giving the results it was found advisable to combine the measurements in groups representing one division of the micrometer scale, that is about  $4 \mu$ , as this smoothed out any apparent discrepancies that showed when individual variations of  $1 \mu$  were taken, on account of the relatively small number in each group in the latter case. All the maximum and minimum diameters of the hundred eggs for each species are taken together and appear in the table as the numbers in one hundred measurements.

In addition to these hundred eggs for each species one abnormally large egg measuring  $50 \times 43 \mu$  was noted in the *T. saginata*, and in the *T. solium* slide one egg was seen with a

TABLE

Size of diameter	MAXIMUM		MINIMUM	
	<i>T. solium</i>	<i>T. saginata</i>	<i>T. solium</i>	<i>T. saginata</i>
31-34 $\mu$	4	5	57	58
35-38 $\mu$	28	39	43	42
39-43 $\mu$	66	54	0	0
Over 43 $\mu$	2	2	0	0

minimum diameter of 30  $\mu$ ; this was the smallest egg seen. The latter observation is of interest when it is remembered that the shorter diameter of *T. saginata* is practically universally recorded as 20 to 30  $\mu$ , well below the shortest diameter noted in this investigation with one exception.

If the grouping is slightly altered from that given in the table and the eggs with minimum diameters of 32 to 35  $\mu$  are taken together it is found that 81 *T. solium* and 86 *T. saginata* eggs fall within it. During this examination three *T. solium* and six *T. saginata* eggs were measured which showed diameters equal in both directions, that is they were apparently globular. In the case of *T. saginata* the six eggs were all between 33 and 35  $\mu$  in diameter, two of the *T. solium* eggs were 35  $\mu$  and the other was 32  $\mu$ . That is, these eight eggs are all in the group containing over 80 per cent of the recorded minimum diameters, so it is suggested that eggs with equal diameters in both directions are possibly oval eggs that are being viewed end on, and that consequently only the minimum diameter is visible. It is a common experience in examining hookworm eggs in large numbers, as in the course of counting, to see an occasional egg that is lying in this position and therefore has a circular contour, but no one has yet suggested on this account that some hookworm eggs are globular.

The coincidence in the measurements of the eggs from these two worms is so remarkable that it was not considered worth while measuring more than one hundred of each to establish the fact that, for practical purposes, they are indistinguishable.

### Conclusion

The statement by Southwell (1930) that the eggs of *T. solium* and *T. saginata* are indistinguishable has been shown to be correct, and a study of the literature has revealed an excellent example of the all too common habit that authors have of taking a statement from older publications and copying it year after year without it being put to the proof of correctness.

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## THE GIANT-CELL TUMOUR OF BONE

(WITH A REPORT OF SIX CASES)

By V. S. HARIHARAN, M.B., F.R.C.S. (Eng.)  
 Surgeon, Ramakrishna Mission Hospital, Rangoon

AMONGST all the controversies regarding the classification of osteogenic neoplasms, the giant-cell tumour, under one name or another, has always remained a distinct entity. In fact, the subject of contention in this connection has been the nomenclature of this distinct variety of tumour formation in the bone which, though locally destructive, practically never presents any of the general features of malignancy. It has been very widely known as the myeloma of bone, but to differentiate its origin from the osteopoietic tissue of the bone as distinct from the multiple myeloma arising from the hæmopoietic tissue in the bone-marrow this term has been found to be rather unsatisfactory. The appendage of *sarcoma* as in myeloid sarcoma and giant-celled sarcoma is a misnomer and, besides leading to confusion, gives the tumour a serious prognostic outlook which is far from being correct. Osteoclastoma—the name recently suggested by M. J. Stewart—begs the question of the origin of the giant cells in the tumour, and, so long as this question as to whether they arise from the osteoclasts or the endothelial cell of the bone remains *sub judice*, this nomenclature is rather unacceptable. The consensus of surgical opinion is that the term giant-cell tumour suggested by the American registry of bone sarcoma is satisfactory though not perfect, and among the other tumours of the bone containing giant cell this remains a distinct entity.

The nomenclature is made more difficult because of the lack of definite knowledge regarding its ætiology which is no exception to the vexed question of the ætiology of tumours in general. It occurs equally well in adult men as well as women and is rarely known to occur in children. It has practically no causative connection to trauma of any nature, though a history of trauma is often obtainable. It is rather accidental than causative.

The giant-cell tumour may be periosteal arising from the periosteum of the upper or the lower jaw where it constitutes one variety of epulis, or it may be medullary in type arising from the endosteum of the extremities of certain of the long bones such as the head of the tibia, lower end of femur, upper end of humerus, lower end of radius, upper end of fibula and occasionally at the sternal end of the clavicle. Rarely it is found to occur at the non-osseous sites such as the tendon sheaths, bursæ and capsule of joints. The endosteal form occurs in the diaphyseal end of one of the long bones mentioned above, where the affected part is expanded to form a tumour of varying size. The tumour is somewhat rounded in shape, the bone appearing



to expand more or less equally in all directions or it may project more in one direction than the other. It is covered by periosteum and the bony shell underneath may be so thinned out that a sensation of egg-shell crackling is obtained on pressure with the finger.

The cut surface usually exhibits a uniformly dark-red appearance owing to its great vascularity and the presence of blood clots. More frequently it looks somewhat mottled like the cut surface of a pomegranate, the lighter areas indicating the sites of old and altered blood clots or of patches of degenerated necrotic tissue. With advancing degeneration, cysts containing a brownish fluid form inside the tumour. Round the periphery of the growth is a narrow zone of more solid tissue, pinkish-white in colour, indicating a zone of more active tumour growth. This has a low local malignancy destroying the shell of overlying bone. New bone is formed from the osteogenic shells of the periosteum to form a new bony wall to the tumour. The bony shell of the tumour is thus re-formed from the periosteum after destruction by the tumour growth, or it is possible that it is the expanded remnant of what was once the wall of the normal compact bone. The remains of the cancellous tissue may be represented by a few odd spicules of bone scattered irregularly in the pulp of the tumour.

The periosteal variety grows from the alveolar margin of the jaw in the form of a hard, more or less pedunculated growth covered by mucous membrane unless it is ulcerated.

Histologically, the tumour is made up of spindle-shaped cells without hyperchromatic nuclei. But what catches the eye most is the presence of large numbers of giant cells of different sizes, numerous in one part of the microscopic field and scanty or absent in another. The giant cells possess numerous small oval nuclei situated towards the centre of the cells and not around the periphery as in tuberculosis. The cytoplasm is opaque, abundant, and basophilic. These have the general characteristics of foreign-body giant cells and may be large osteoclasts or may be derived from the endothelial cells of the bone. No atypical forms are seen as in sarcomas. Numerous wide thin-walled blood vessels are seen with extravasated erythrocytes showing the tumour to be highly vascular. Some areas may reveal the remains of the osseous lamellæ homogeneous in appearance and stained red by eosine, patches of myxomatous and fatty degeneration and areas of necrosis with feebly-stained cells and degenerating nuclei.

Osteitis fibrosa cystica, first described by von Recklinghausen in 1891, seems to have a direct relationship to the giant-cell tumour of the bone. Cases have been described from time to time (like case 6 herein reported) where different portions of the same tumour present the typical appearances of the giant-cell tumour and of the

fibrocystic disease of the localized type. Cysts form in both conditions and typical giant cells, as in the giant-cell tumour, are often found in the walls of the cysts in the localized fibrocystic disease of bone. Typical giant-cell tumour is also known to arise from a previous case of localized fibrocystic disease, as is probably the case in case 3 herein reported. Pathologically many American authorities, notably Ewing (1922), consider the giant-cell tumour as a separate variety derived from a common condition—osteitis fibrosa cystica.

Bloodgood (1910) and others consider the fibrocystic disease to be essentially inflammatory in origin, i.e., a low-grade form of osteomyelitis. Or it may be one of the obscure disorders of calcium metabolism due to hyperactivity of the parathyroid glands. Phemister and Key (1933) suspect a low-grade infection and claim to have cultured the infective organisms from the cyst wall of some of their cases.

The direct relationship between osteitis fibrosa cystica and the giant-cell tumour, as explained above, makes one agree with Barrie who considers the process in the giant-cell tumour to be inflammatory and not neoplastic, and to him it is a chronic hæmorrhagic osteomyelitis. Considerable evidence is also accumulating to show that the bone cysts and possibly the giant-cell tumours are due to the hyperactivity of the parathyroid glands.

The condition is essentially chronic in nature. The patient complains of slight fleeting pain, but never severe as in sarcoma, of a swelling in one of the usual sites of tumour, or he may consult for a fracture of the bone due to some very trivial accident or violent muscular movement. Thus pain, swelling, or spontaneous fracture form the three essential symptoms of the condition.

On examination, a tumour of varying size is discovered in one of the usual sites of the condition, towards the ends of the bones. It is more or less rounded in shape, situated more on the diaphyseal side of the end of the bone, though the epiphyseal side may also be involved by the local destructive process. The articular cartilage remains more or less intact and movements of the joint may be obtained but for the mechanical impediment due to the size of the tumour. The adjacent joint may contain slight fluid as a result of synovitis. The tumour may be hard, soft, or fluctuating giving an egg-shell crackling according to the extent of degenerative processes and bony destruction by the subjacent tumour growth. Blue telangiectatic veins may be present coursing over the subcutaneous surface of the tumour, caused by mechanical pressure of the tumour on the main venous channels, and rarely the tumour may be hot and pulsating due to the highly vascular nature of the tumour. More rarely still it may have ulcerated presenting a raw red fungating ulcer on the surface exuding a sanious fluid or

even blood and presenting a hæmorrhagic appearance. The bone distal to the tumour is normal and there may be a fracture at the site of the tumour. The distal portion of the limb is usually normal but may occasionally be œdematous from venous obstruction. The general condition of the patient is good except for any secondary infection from an ulcerated tumour. The urine is normal and does not contain Bence-Jones protein, which is only found in cases of multiple myelomata and in some cases of generalized fibrocystic disease.

X-ray shows the end of the bone expanded with the rest of the diaphysis normal and with no inflammatory periostitis round the tumour. The expanded shell of bone may present varying grades of thickness with the lamellæ of bone traversing the matrix and dividing it up into cysts of different size and number, giving the whole tumour a honeycombed appearance. The lower limit of the tumour appears rounded and cut off distinctly from the rest of the diaphysis. Fracture, if present, is detected by the discontinuity in the length of the bone, and when the bony shell growth is notable, to keep up with the destructive process of tumour growth, the shells of bone appear as islets of thinned out bone with discontinuity of bone surface.

The diagnosis is rather difficult even with the help of x-ray pictures. It has to be differentiated from the other bone conditions of a similar nature, such as the Brodie's abscess, tuberculosis, and gumma of the bone, the many varieties of sarcoma, secondary carcinoma and the occasional hydatid cyst in the bones. Rarely enough it may be mistaken for osteomyelitis. A systematic examination together with x-ray will go a long way to help to arrive at the correct diagnosis of the condition. Difficulty arises in differentiating it from fibrocystic disease because one may develop into the other or both may be associated together in the same condition.

The treatment is essentially conservative in nature. Local excision removes the growth, and in cases where portion of the compact bone can be saved partial excision with thorough curettage of the tumour tissue together with swabbing the residual bony cavity with carbolic and alcohol or iodine will be sufficient to ensure a permanent cure of the condition. Recurrences are rare or uncommon. Where the tumour occurs in single bones of the limb excision will leave the distal portion of the limb unsupported. A successful bone graft has saved many a limb in such cases. However this has to be considered more seriously in the case of the lower extremity where the question of weight-bearing has to be specially considered. When it is highly doubtful whether this will be possible, amputation of the limb will have to be resorted to, but in all cases amputation must be regarded as a last resort. Even in cases of the lower extremity conservative measures with

bone grafting, if necessary, may be given a trial in the first instance and amputation resorted to only if it proves a failure. The recuperative and compensatory processes of nature are well known to be far beyond the ken of human judgment and it is always advisable to give the patient the benefit of the doubt. However perfect an artificial limb may be it is hard to compare it with nature's handiwork, not to speak of the sentiments of the patients. However, in really hopeless cases there is no use stretching the argument to the extreme and submitting the patient to the risks of operation twice. The surgeon's responsibility is thus enhanced in arriving at the correct decision in the matter of amputation.

The following cases tend to throw some light on some of the problems that present themselves to the surgeon when dealing with the varieties of this condition.

*Case 1.*—Patient A., aged 18, male, was admitted into the hospital in May 1933 with a tumour on the upper end of the left humerus. The duration of the disease was 13 months. He had slight pain, but not so severe as to interfere with his work.

The tumour was large and rounded, of the size of a tennis ball, occupying the whole of the upper end of the humerus including the epiphyseal region. The surface veins were evident as blue lines coursing irregularly over the surface. There was slight pulsation on palpation as also egg-shell crackling. The rest of the humerus felt normal, as also the distal portion of the limb. There was slight limitation of movement at the shoulder only due to the size of the tumour.

X-ray showed a typical giant-cell tumour of the upper end of the humerus.

The patient refused operation and absconded. Local excision of the tumour with a bone graft from the tibia as in case 6, below, would have cured the disease and at the same time saved the limb.

*Case 2.*—Patient B., aged about 36, female, was seen by me in October 1933 on account of a fall she had and consequent injury to her right knee. She had pain in the upper end of the tibia for about a year. She had consulted doctors who after proper examination and x-rays had diagnosed the condition as a giant-cell tumour of the upper end of the right tibia. On examination the region of the knee joint was swollen and the skin discoloured. It was warm on palpation and there was distinct egg-shell crackling on the outer aspect of the upper end of the tibia in front of the head of the fibula. It was very tender and the knee joint was distended with fluid. There was rather free movement at the knee joint limited only by the synovitis and the tenderness due to the injury. There was slight œdema of the leg distal to the knee. X-ray showed a typical giant-cell tumour on the upper end of the right tibia, with the shell of bone intact and with no fracture of the bone.

The knee joint was aspirated and about two ounces of thick blood-red fluid were removed. Lead lotion was applied and the knee joint kept at rest. The inflammation subsided gradually and the joint was kept at rest in a stiff knee cage and the patient not allowed to walk about.

On further consultations the consensus of surgical opinion was that amputation at the lower third of the thigh was the only safe treatment feasible because it was the tibia that was affected and that after any local excision there would not be proper support for the leg to bear any weight. The patient was averse to operation of any sort and was much less willing for amputation.

However I advised a conservative operation in the first instance and that the radical amputation could be

done if this were to prove a failure. After due consideration the patient consented to the operation and the further course of the case showed the wise move she had adopted.

She was operated on in December 1933. The great danger at the time of the operation is hæmorrhage and the later danger is infection. The latter makes the healing process long and tedious and kills the bone graft, if any. All steps were taken to effectively prevent the advent of any secondary infection together with the no-touch-technique throughout the operation. A tourniquet was applied to the middle of the thigh to control the hæmorrhage and in fact at the end of the operation she had lost less than two drams of blood. Pure chloroform was used as the anæsthetic. Since the patient was very nervous there was no question of using local or spinal anæsthesia and since she had a history of pleurisy and tuberculous glands in the neck ether as an anæsthetic was strictly avoided.

An external linear incision four inches long was made stretching downwards from the level of the knee joint. Particular care was taken not to open the joint. The bone was freely exposed and a shell of bone one and a half inches in diameter was punched out from the outer condyle of the tibia in front of the upper tibio-fibular articulation. The whole of the tumour-laden cavity was thus laid open. The tumour mass was thoroughly scooped out until bare bone was felt in the posterior medial and lower aspects. Towards the articular aspect the less hard articular cartilage was felt, and particular care was taken not to damage the integrity and continuity of this. The whole cavity was then swabbed with phenol and then with rectified spirit. A few chips of bone were chiselled out from the middle of the shin of the same tibia and these were packed into the bony cavity left behind. A flap from the peroneal muscles was also separated distally and turned up into the cavity so as to fill in the same. The wound was sutured over in two layers with interrupted stitches and dressed. A back splint made of a plaster-of-paris slab was applied stretching from the middle of the thigh to the sole of the foot so that the knee and ankle joints were both immobilized. The tourniquet was then removed. The patient had an uninterrupted recovery with a maximum temperature of only 99.5°F. for three or four days. The stitches were removed on the tenth day and the whole limb put in plaster-of-paris casing from the middle of the thigh and including the foot.

Since it was rather uncomfortable the plaster casing was slit up two weeks later into two halves, upper and lower, and the limb still kept immobile. Two weeks later passive movements were started for the ankle joint and five days later for the knee joint also. In six weeks the patient was able to sit up in bed and move the joints herself, with the use of the back splint only at nights. In two months the splint was completely removed. The site of the tumour was hard to the touch and the outer condyle of the tibia felt hard and rounded. There was little or no pain. Medical diathermy and ultra-violet-ray exposures were given for about a week. She was allowed gradually to bear weight on the affected leg, first with the help of a stick and later without it.

Pathological examination of the growth removed at the operation showed typical giant-cell tumour with no suspicion of malignancy at all.

In June 1934 surface application of radium was made so as to destroy by its radiations any more tumour tissue that might be present. X-rays have been taken every month or once in two months regularly and a little honeycombing is found to persist on the outer aspect. I am inclined to think that this is due probably to the muscle graft that has been put in. Deep x-ray therapy to the part will help a great deal to drive off any more suspicion of recurrence of the tumour.

Clinically, the upper end of the tibia is now hard with no feeling of any cavity or thinned-out bone, and the movements of the knee joint are quite free. She is walking about now, climbs stairs by herself and is just as strong on her leg as ever before.

*Case 3.*—Patient C., aged about 45, female, came to the hospital in December 1933 with the history of her right leg giving way while climbing stairs and spraining her thigh muscles. On examination there was a fracture of the middle of the right femur and the history was suggestive of a spontaneous fracture. X-ray confirmed the fracture with slight lateral displacement of the fragments. It further showed an area of rarefaction with cavities in the bone. There was no primary malignant tumour anywhere and the patient was otherwise healthy. A tentative diagnosis of fibrocystic disease was made and an operation advised.

A local excision of the affected part of the bone on both sides of the site of fracture was made and about three inches of bone thus removed. The ends of the bone were brought together and plated. The wound was closed in two layers and the limb put in plaster-of-paris casing including the hip and the foot. The patient had slight temperature of 100°F. for two or three days and had an uninterrupted recovery. In two months she was able to move the limb herself, with a shortening of three inches.

The excised part of the bone showed five or six cysts and the cysts wall showed on microscopic examination giant cells typical of giant-cell tumour. This is probably an instance where the condition started as a fibrocystic disease and developed the tendencies of giant-cell tumour later on. The two are probably different appearances of the same pathological process and it is hard to know where one ends and the other begins. Further evidence is of course required for proof of this.

She was walking about with the aid of crutches and was advised to undergo another operation to shorten the femur of the opposite side. She refused however and was later lost sight of.

*Case 4.*—Patient D., aged about 25, female, came to the hospital in April 1934 with a hæmorrhagic ulcer on the radial aspect of a swelling of the lower end of the right forearm. The duration of the disease was about six months. The tumour was pear-shaped and of the size of a small orange. It looked like a sarcoma of the lower end of the radius, but x-ray showed an expanded lower end of the radius with the rest of the diaphysis normal. There was discontinuity of the bony shell on the radial aspect where the ulcer was present. The ulna was normal in appearance. Her general condition was on the whole good. A tentative diagnosis of giant-cell tumour of the lower end of the radius was made. The ulcer was dressed with eusol for two or three days and it was then clean.

A week later a local excision of the tumour was done, a bone graft four inches long from the right tibia was inserted and the limb put in a plaster-of-paris pad with the wrist dorsiflexed. The wound however got septic, the graft was dead and had to be removed. The septic wound healed in six weeks and the patient was discharged with a deformed limb. No pathological examination of the specimen could be done.

Two months later the patient came back again with a sarcoma of the lower end of the ulna and the limb was then amputated at the lower third of the humerus.

The initial tumour was a sarcoma to start with and had probably affected the ulna also at the time; or the sarcoma of the ulna may be an independent process altogether. The lack of pathological evidence of the first specimen leaves the whole thing in doubt. The bone graft should have been avoided at the time of the primary operation, because of the ulcerated condition of the tumour and the impossibility of avoiding post-operative suppuration.

*Case 5.*—Patient E., aged 18, male, was admitted into the hospital in January 1934 with a swelling of the lower end of the left thigh and knee and with a sinus on the internal aspect of the knee exuding pus mixed with a sanious discharge.

The history was as follows:—He had a feeling of numbness in his leg for five months and there was also a swelling in the lower part of the thigh. One day he felt something breaking near the knee joint and was not able to move the joint after that. He went to a

doctor who diagnosed the condition as an abscess probably due to osteomyelitis. He incised on the inner aspect but could get only blood and no pus. He dressed the case for a month and a half and sent him to the hospital. The sinus on the medial aspect was the result of the operation. He had also developed a bed sore over the posterior aspect of the sacrum.

The whole part including the distal portion of the limb was hot, tender and oedematous and looked like cellulitis. He had a temperature of 103°F. on admission with a pulse of 130 per minute and his general condition was very toxic. The swelling was of the size of a big coco-nut, but the upper part of the femur was normal. There was no pulsation of the tumour on palpation. Twenty cubic centimetres of blood-stained fluid were aspirated from the knee joint. A large giant-cell tumour of the lower end of the femur with a pathological fracture were seen on x-ray examination. The tumour had overgrown the limits of the bony shell which only appeared as a few islets on the inner side.

The condition of the patient was so precarious that the only idea was to save his life. The limb was amputated at the middle of the femur and the flaps kept open. It was daily dressed with eusol, and anti-gas-gangrene serum was freely administered to prevent spreading infection. The patient gradually came round and on the 14th day after the operation the wound was closed with a side drain. He put on weight, the wound and the bed sore healed and he was discharged minus his left leg seven weeks after his admission into the hospital. I have heard from him since and he is quite well and has had no recurrence of the trouble.

Case 6.—Patient F., aged 20, male, carpenter by trade, was admitted into the hospital in October 1934 complaining of pain and swelling in the upper third of the right arm. The history was rather interesting. Seven years back he had a fracture of the upper third of the right humerus due to an injury. Three times after that he had fractured the same bone at the same site due to a fall from a camel. This time he was trying to throw a stick at a dog and felt his arm giving way at the same site.

On examination there was a fusiform swelling in the upper third of right humerus extending to the head of the bone. There was also a distinct fracture at the site. The shoulder joint was free. There was no temperature and his general condition was quite good. It was distinctly a pathological fracture.

X-ray showed a pathological fracture due to rarefaction from a cystic condition of the bone. A tentative diagnosis of fibrocystic disease of the humerus was made and the patient advised operation.

A local excision of the diseased portion of the bone left only the head of the bone above and the lower two-thirds of the humerus below with a gap of four inches in between. A bone graft four and a half inches long was removed from the right shin and was put into the medulla of the lower fragment below and into a scooped out cavity on the distal surface of the upper fragment above. The wound was then sutured in three layers with interrupted stitches and dressed. The whole of the upper right extremity was then put in plaster-of-paris casing with the limb in the 'aeroplane' position.

Pathologically the specimen removed showed distinct areas of giant-cell tumour and other areas of fibrocystic disease.

The patient had a temperature of 101°F. for three days and gradually came down to normal. He was able to sit and walk about in a week's time with the limb still in plaster. After six weeks the plaster was cut, the sutures removed and the limb put up in the same position in a gutter-shaped plaster pad applied only to the under aspect of the arm so as to support it, but the patient was allowed to try to lift the limb up from the pad once a day. Passive and active movements were started regularly a fortnight later. In another three weeks the splint was left off and the patient instructed to move the shoulder as much as possible with the help of the other hand, and to keep the arm to his

(Continued at foot of next column)

## PROPHYLAXIS OF CHICKEN-POX BY INOCULATION WITH VESICULAR FLUID

By R. C. WATS, M.D., D.P.H., D.T.M.  
MAJOR, I.M.S.

and

N. P. DALAL, M.B., B.S., D.P.H., D.T.M. & H.  
(Haffkine Institute, Bombay)

THE majority of those in touch with chicken-pox consider it unnecessary to employ any prophylactic measures against the disease owing

(Continued from previous column)

side while sleeping. X-rays were taken at regular intervals. The graft was getting organized and the humerus becoming a solid whole. There was ankylosis at the shoulder joint and the movements of the head in the glenoid cavity of the scapula were getting restricted. However the scapular movements on the chest wall were making up for the loss of shoulder movements. He was discharged in May 1935 with no pain and the movements fairly free, but for the limitations at the shoulder joint as explained above. He was able to lift things with the right hand and to do light work. He came back again three months later and showed that he was able to do more heavy work with that hand. He was looking forward to do his carpentry work.

### Conclusions

1. The direct relationship between the giant-cell tumour and the localized fibrocystic disease is shown and both the pathological conditions may be found in different parts of the same tumour.
2. The difficulty of differentiating the giant-cell tumour from an osteogenic sarcoma is demonstrated, especially when the tumour has ulcerated on to the surface.
3. The appearance of sarcoma in the adjacent bone after a tentative diagnosis and consequent local excision of the giant-cell tumour in the other is described.
4. The possibility of saving the limb by means of a bone graft where otherwise the limb would have been amputated is proved.
5. The need for amputation still exists in really hopeless cases.

N.B.—These cases were under my care when I was the Principal Medical Officer of Bikaner State, Rajputana, India.

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to its mildness and rapid spontaneous recovery. In some cases, however, the contagiousness of the disease interferes so much with the normal routine that the work comes to a standstill. As an example we might quote the instance of a training battalion in India, where the majority of the recruits were either suffering from the disease or were isolated as contacts. In such cases any practical method for prophylactic purposes would be very desirable.

Greenthal (1926) vaccinated 36 contacts with vesicular fluid from a case of chicken-pox; 19 of these showed a typical vesicle. None of the cases developed the disease but, as there were no controls, the experiment was inconclusive. Waddell and Eley (1927) vaccinated similarly 23 contacts, eight of whom developed the typical vesicle. There is no mention of controls in the series and it is quite probable that the majority of the vaccinated people were immune already as only 33 per cent developed the typical vesicle. Hisse and Unger (1928) injected 38 children intravenously with vesicular

*Difference in the technique adopted.*—There is, however, one noteworthy difference between the technique referred to in the literature above and our own. In the former case the vesicular fluid was taken as such but we have filtered the diluted material in a Chamberland L3 candle to safeguard against any pyogenic infections. We have recorded this fact as we are not sure what effect the filtration has on the virus.

#### Experiment I

*Material employed.*—(1) The vesicular fluid was collected from two cases on the fourth day of the disease, suitably diluted to make a 20 per cent dilution with normal saline and filtered through a Chamberland L3 candle. (2) Normal saline (0.85 per cent).

*Procedure.*—An intradermal injection of 0.2 c.cm. of the appropriate solution was given on the left forearm.

Table I summarizes the result of the experiment.

TABLE I  
Age group 14 to 18 years

Material employed	Total number inoculated	Local reaction	REMARKS
The vesicular fluid. 20 per cent.	64	Twenty-one (33 per cent) had erythematous patches slightly raised measuring on an average 1.5 centimetres.	Five of the 21 had headaches in addition to local reactions.
Normal saline ..	10	Three (33 per cent) had erythema as above.	No headache.

fluid after suitable dilution. Angarano and Gabriele (1931), following Fabris' technique, employed pure vesicular fluid as well as a 20 per cent dilution of the vesicular fluid intradermally for prophylactic purposes. The total number of cases thus protected was 12 with three controls. As two of the latter developed the disease there is some evidence that such a procedure may be of some value, but the number of cases is rather small.

A mild outbreak of chicken-pox was reported from I. M. M. T. S. 'Dufferin'. The first case reported sick on 13th February, and up to 31st March, 1936, there were 15 cases altogether. On the advice of the port health officer, it was decided to use the intradermal method, referred to above, to protect the contacts. Normal saline was injected for control purposes.

The controls as well as the vaccinated were observed for nine months but none contracted chicken-pox.

#### Experiment II

In the following experiment an attempt was made to ascertain if the serum from chicken-pox cases could be substituted for the vesicular fluid. The serum which was left over after the Wassermann test of the two cases (see experiment I) was diluted with normal saline to give a concentration of 10 per cent and filtered through a Chamberland L3 candle. Normal saline was used as control. An intradermal injection of 0.2 c.cm. of the appropriate solution was given on the left forearm.

The results are tabulated in table II.

TABLE II

Age group	Total number inoculated	Local reaction	REMARKS
(a) Inoculated with the serum (10 per cent).			
14 to 18 years ..	21	Seven (33 per cent) had erythema as in experiment I.	No headaches.
20 to 50 years ..	44	Eight (17 per cent) had erythema as above.	Do.
(b) Inoculated with normal saline.			
14 to 18 years ..	10	Three (33 per cent) had erythema as above.	Do.
20 to 50 years ..	48	Eight (17 per cent) had erythema as above.	Do.



The controls as well as those vaccinated were observed for nine months but none contracted chicken-pox.

**Summary and conclusion.**—As there were no cases after the inoculation in any group, the value of the prophylactic measure cannot be gauged. It is evident that neither the vesicular fluid nor the serum of the patients collected on the fourth day, diluted and filtered as above, was capable of producing the disease after an intradermal inoculation. Amongst the vesicular-fluid group about 8 per cent had headaches in addition to the erythema, the other groups being free from this symptom.

This note was written as there seems to be a general impression that vaccination with the vesicular material checked the epidemic on board I. M. M. T. S. 'Dufferin'.

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## A Mirror of Hospital Practice

### FATAL CASE OF ACUTE GONORRHOEA (SEPTICÆMIA WITH ULCERATIVE\* ENDOCARDITIS)

By P. V. KARAMCHANDANI, M.B., F.R.C.P.E.

MAJOR, I.M.S.

Officer in charge, Brigade Laboratory, Mhow, C. I.

RIFLEMAN N., aged 29 years, exposed himself to infection at Indore on 27th October, 1935, and noticed a urethral discharge on 29th. About the 12th November he noticed a papule on the dorsal aspect of the penis under the prepuce, which eroded and formed into a sore before his admission to the Indian Military Hospital, Mhow, ten days later.

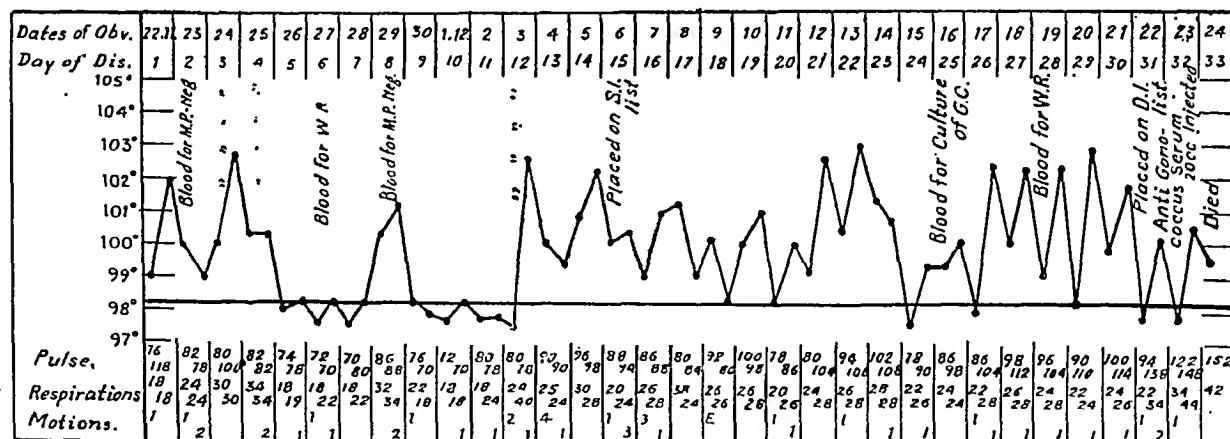
The sore, on admission, was found to be indolent and painless, with surrounding infiltration. Urethral discharge was purulent, yellow and thick. Epithelial

He was given the following treatment:—

1. Milk diet and barley water freely.
2. Potassium permanganate lavage 1 in 20,000 B.D. (anterior irrigation pint 1, posterior pints 2, strength to be gradually increased to 1 in 8,000).
3. Calomel grs. 2 at bed time. Mist. salina oz. 1 next morning.
4. Hot fomentations over the bubo four-hourly.
5. Saline dressing over the sore.
6. Tincture belladonna .. .. min. v  
 Potassium citrate .. .. grs. xv  
 Potassium bicarbonate .. .. grs. xv  
 Tincture hyoscyamus .. .. min. xv  
 Infusion buchu .. .. to oz. 1

Sig. oz. 1, t.i.d.

23rd November.—Blood film was negative for malarial parasites and the dark-ground examination of exudate from the sore on the penis revealed no spirochætes.



cells, gonococci and pus cells were in large numbers, the last being in great excess, which suggested that he had had gonorrhœa for three weeks without treatment. He had a bubo in the right groin, without signs of acute inflammation or redness of the overlying skin. Spermatic cords, testicles, Cowper's glands, prostate and seminal vesicles showed no abnormality. There was nothing abnormal in the urine except that the 2-glass test showed turbidity in both glasses, indicating anterior and posterior urethritis.

His temperature was 99°F., pulse 76 per minute, respiration 18 per minute. There was nothing abnormal in any of his systems. He had a roseolar rash, pinkish in colour, extending over trunk and limbs, more marked on the latter, it looked like the prepapular rash of early secondary syphilis.

\* Abridged by Editor.

Until the 3rd December the patient had no special complaint. Rectal examination revealed no enlargement or tenderness over the prostate. His temperature kept normal except for rises on 24th, 25th and 29th of November which was probably due to the rash. The blood was strongly positive to the Wassermann reaction on 26th November.

On the 3rd December, patient had a sudden rise of temperature to 103°F., complained of discomfort on micturition with increased frequency. Urine showed turbidity in all the four glasses. He was given a dose of saline mixture and alkaline mixture four-hourly.

Barley water and glucose water (5 per cent) not less than 4 pints in 24 hours.

Next day the patient developed prostatitis. He looked definitely ill. Urethral discharge had diminished, and the smarting sensation during micturition had



increased and his prostate was found to be tender on rectal examination. His blood showed no malaria parasites and the differential leucocyte count was: polymorphonuclears—70 per cent, lymphocytes—23 per cent, large monocytes—7 per cent.

Lungs were clear, heart showed nothing abnormal, liver and spleen not enlarged.

He was given (1) urodonal 1 drachm three times daily, (2) hot Sitz bath for 20 minutes twice a day, (3) rectal lavage with boric lotion (temperature 116°F.) directed on the prostate, three times a day, (4) hot fomentations to perinæum four-hourly. All routine urethral treatment was stopped. He showed no improvement, developed aching pains in the chest and limbs and was put on 'S. I.' list on 6th December.

By 7th December he had developed vesiculitis and orchitis, and was given (1) suppository of atropin gr. 1/75 with extract belladonna gr. 1/4 at bed time, and (2) application of glycerine-belladonna locally over testicles.

Up to the 10th December the patient felt better and micturition was easy. But that was perhaps the period when migration and settlement of infection was occurring in distant parts, because on the 11th he developed acute arthritis in the right knee joint. There was no swelling or effusion, but great pain on movement of knee joint.

Sulpharsphenamine 0.12 gramme was given intravenously and antiphlogistine applied over knee joint.

On 12th December both the knee joints were painful, while on 16th arthritis had extended to all the joints of the body, the knees, shoulders and right elbow being the worst. Blood was taken for culture on 14th December and gonococci were isolated.

Sitz baths and rectal douches were stopped and mixed vaccine (gonostaphylococcal) 1 c.cm. (first dose) was given subcutaneously.

On 17th the patient developed endocarditis as revealed by a localized presystolic murmur. Heart was not enlarged. From now on the patient gradually got worse, became toxæmic and exhausted.

On 20th he developed intense pain in his cardiac area and auscultation revealed crentations of pleuro-pericarditis; spleen became tender and enlarged; temperature high, regular quotidian intermittent type (see chart); and pain became generalized all over his body. There was no evidence of myocarditis.

On 22nd December gonococcal serum 22 c.cm. was given in the morning and patient placed on 'D. I.' list.

At 3 p.m. patient suddenly became unconscious with conjugate deviation of eyes to the right (indicating a cerebral lesion on the left side). Pupils were dilated and insensitive. Pulse was full, 134 per minute, and respiration hurried, 40 per minute. This sudden apoplexy without any prodromal symptoms in the presence of an obvious endocarditis involving the mitral valve pointed to cerebral embolism.

On the following day he developed paralysis of the muscles of deglutition and had an unconscious evacuation of urine in bed. He remained unconscious, and died at 4-10 p.m. on 24th December, 1935.

Post mortem was performed at 9-30 a.m. the next morning.

#### Findings:—

**Heart.**—Pericardial sac contained turbid fluid (commonly associated with infections of blood stream).

**Epicardium.**—Patches of whitish appearance of varying sizes up to half an inch square looking more like 'soldier spots' than 'milk spots'.

**Endocardium.**—Warty excrescences varying in size from a pin's head to a bean present on the auricular surface of mitral cusps, a short distance from their margins and spreading on to corde tendinæ; muscili papillaris swollen and inflamed; no extension over mural endocardium or intima of aorta; vegetations of crumbling type; aortic cusps normal in appearance.

**Lungs.**—Crenitant and floated in water.

**Left lung.**—One abscess at the cardio-pleural junction, apparently the cause of the pain which patient complained on 20th December, over which crepitations were

heard on auscultation. There were two more abscesses in the lower lobe (posterior aspect). The abscesses were surrounded by an area of secondary inflammation. Smear of pus from the abscess at the pleuro-cardiac junction showed Gram-negative diplococci resembling gonococci.

**Liver.**—Slight increase in size. On section it was found to be in the advanced stage of cloudy swelling that is seen in septicæmia and ulcerative endocarditis. The substance of the liver was soft and its tissue yellowish. No areas of necrosis discernible to the naked eye.

**Spleen.**—Swollen and soft in consistence. On section it had a pinkish creamy colour with white infarction present in its upper half.

**Kidneys.**—Appeared normal.

My excuse for publishing this case is its comparative rarity, its failure to respond to routine treatment, and the regular march of complications from posterior urethritis to cerebral embolism. The failure to respond to treatment may have been partly due to the syphilitic infection which the man had apparently contracted concurrently with the gonorrhoea.

## MALIGNANT DISEASE OF THE PROSTATE IN A SMALL CHILD

By RAI BAHADUR HUKAM CHAND GUPTA  
F.R.C.S. (Edin.)

Civil Surgeon, Mardan, Peshawar, North-West Frontier Province

A MALE child, about 3 years of age, was admitted into the Lady Reading Hospital, Peshawar, on the 16th September, 1936, with difficulty in micturition, which had existed for 15 days. There was no history of any trouble previously. The child was well developed for his age but looked rather pulled down and had a temperature slightly above normal. Stone in the bladder was suspected so he was to be prepared for operation.

On the 18th September he was anaesthetized: his bladder was sounded; no stone was felt but only a peculiar rough, feel of the bladder wall. As there was a very definite history of painful micturition, the bladder was opened suprapubically. A hard nodular growth was felt around the internal urethra. The prostate was also felt through the bladder to be enlarged. The growth was very hard and a few of the nodules were scraped out for examination. The bladder was drained suprapubically and the wound closed.

The prostate was very enlarged and hard when felt per rectum. There was no hæmaturia. A provisional diagnosis of sarcoma of the prostate with involvement of the bladder was made, awaiting confirmation from the laboratory.

The nodules that had been removed were sent to the Provincial Laboratory for report. Lieutenant-Colonel W. E. R. Dimond, I.M.S., kindly examined the material and reported it to be a case of early malignancy.

The wound healed perfectly but had to be kept open for purposes of micturition as no urine was passed per urethram. The child was discharged from the hospital a month after.

I have since learnt the child died one month after discharge from the hospital and no post mortem was done owing to the difficulty of obtaining permission from the parents.

This case is of interest on account of the rarity of such a condition in so young a child.

# Indian Medical Gazette

MARCH

## DIET AND ADAPTATION TO THE TROPICS

THE problem of the adaptation of man to the climatic conditions of the tropics is a wide one. Its study is of interest not only to those in tropical countries but also to others in the temperate zone, for the real significance of one's surroundings in any climate is never fully appreciated until they are changed. The adaptation that man is called on to make in the tropics is primarily one of heat regulation. This physiological adjustment includes a number of factors, such as dwellings, clothes and food, all of which are intimately concerned in the maintenance of that peculiar mammalian feature, namely, a constant body temperature characteristic of each species, and we do not know whether Nature has provided anywhere in the tropics the ideal local conditions necessary for the maintenance of this body temperature. As regards housing and clothing for instance, man himself can do much in the way of adaptation. Food however is in a somewhat different category. Nature provides a varied dietary which man according to his tastes and customs takes or rejects, but we are not yet clear as to what is the optimal or ideal to be aimed at in order to effect a suitable adjustment to the climate.

The problem of diet however cannot really be divorced from that of heat regulation and body temperature. At the present time nutritional studies in this country are concentrating on the adjustment of diet to disease and its prevention. The calories for the time being are in abeyance, yet this is an aspect that should and would receive due attention were there no evidences of nutritional disease to overshadow it.

Man and indeed each mammal species have set themselves at a constant body temperature somewhere in the region of 100 degrees Fahrenheit, whether they live at the poles or the equator. In general, this temperature is maintained by a more-or-less constant, basal metabolism, aided by a physical mechanism which regulates heat loss by conduction and evaporation of water. *A priori* one would have expected that Nature, were body temperature of prime importance, might have endowed man with the capacity for lowering his basal metabolism under certain conditions. It is not so, however, for it appears that adjustment of body temperature has been effected largely by extrinsic factors, such as housing, punkas, clothes and diminished food intake. Nature

appears to demand that we keep up a body temperature of 98 and a basal metabolism of about 39 calories per hour per metre in whatever latitude we may find ourselves. To ask 'why' is hardly a justifiable question; science is concerned only with the 'how'. Some years ago, at a meeting of physiologists in the United States of America, it was suggested that all the mammals had met in the garden of Eden and had decided after discussion to set their temperature and metabolism at that level. In such a flippant manner does the scientific mind react when confronted with a 'why'. Barcroft, however, has pointed out in his *Features in the Architecture of Physiological Function of the Living Body* that the constant temperature and composition of the blood is really an essential condition for the normal functioning of one activity—namely, consciousness. Lower the temperature or the oxygen of the blood beyond a certain point and consciousness is the first to suffer.

The problem however of the suitability or otherwise of a tropical food to the tropical climate is not so easily solved nor are we given so obvious a lead as is the case with housing and clothing. Nature offers fat and protein at the poles and carbohydrates at the equator, and willy-nilly man has accepted what has been given to him. Buckle, in the middle of last century, in *History of Civilization* gives an interesting comment on the significance of fat in the arctic regions. As is well known, fat has a higher caloric value than the other foodstuffs and requires a greater amount of oxygen to oxidize a given weight compared with carbohydrate. At the poles he points out that each breath of inspired air (at the temperature prevailing) carries more oxygen than a corresponding volume of air in the tropics and hence a greater amount of fat can be oxidized. This explanation is perhaps hardly relevant, but the attitude of mind is prophetic of the modern work of L. G. Henderson who has done so much to show the fitness of the environment in relation to the needs of the organism.

The heat-stimulating effect of protein—its specific dynamic action—is one which does appear to play a part in the adjustment of diet to climate. The Eskimos often consume large quantities of meat, sufficient to raise their metabolism over 50 per cent, an obviously practical advantage. In the tropics, on the other hand, a low-protein vegetarian diet is hence from this point of view advisable. A low-fat diet is also a feature of the tropical dietary and within limits probably advantageous. On account of the low-protein diet and a climate making extreme physical work almost impossible, a large calorie intake is never required; in other words one's calories can be supplied without undue bulk in the form mostly of carbohydrates. In the colder parts of the

world where harder physical work can be and often is performed, the calorie intake of a Canadian lumberman for instance, which may be 9,000, could not be consumed as starch without putting too much strain on the demands of the alimentary canal. Such a diet would be almost impossible were it not that fat is very much less bulky than cereal foods, etc. The tropics do not demand an unduly large layer of body fat externally or internally, hence there is a further diminished demand for fat.

Carbohydrates, however, have a definite effect on the physiological mechanism of the body, which seems to be of considerable importance. Numerous workers (Zuntz, Bridges, Puckett and Wiley) have noted that a change from a fat to a starch diet involves a considerable retention of water and *vice versa*. Some of this is taken up by the stored glycogen and some as extra fluid in the extracellular, and probably intracellular, fluids. In other words on a carbohydrate diet there is an increased reservoir of water for evaporation and urine secretion if necessary. Moreover, carbohydrates are always the first to be metabolized and hence *pari passu* more mobile fluid is available while it is being burnt. Further, experiments by Burr and others on rats on a fat-free diet have shown that those animals consume more water and excrete actually less urine than others with fat in their diet. More fluid appears to be eliminated by the skin and lungs. It may be a small point but pulmonary ventilation is greater when carbohydrate rather than fat is being burnt, owing to a larger output of  $\text{CO}_2$  per calorie of heat. This would increase the heat loss by evaporation of water by the lungs.

These experiments are suggestive in the light of the observations of Eijkman in 1924 on Europeans and Malaysians in Java. He noted

that the Malayan is much more economical (physiologically) in his water elimination than the European. Under identical conditions a European lost 143 grammes of water and a Malayan only 105 grammes by insensible perspiration in a given period. Contrary to expectation, the Malayan had also the smaller volume of urine, even though he had received extra water, while the European had been deprived of it during the observation. The European appears to waste water as liquid perspiration which hence does not perform its physiological function—namely, evaporation and heat loss. It is then a problem how much of this adaptation is racial and how much is due to a carbohydrate diet conserving the body fluids. The increased urine elimination of the European may have been due to the greater quantity of nitrogenous products, which would be much less in the Malayan consuming a low-protein diet. The Malayan on the other hand may consume more salt, which, under certain circumstances, promotes retention of water.

Such then are some of the ways in which Nature may have been more beneficent to those at the equator than one thinks. One does not wish to make out an apologia for the time-honoured dietary of thousands of years which nevertheless does seem to lack certain essentials necessary for health. Yet it should be said that it points to the necessity for due caution in laying down nutritional standards which are merely carried over from a temperate zone. Man is an adaptable animal, and, if a healthy body fabric is to be woven, let the warp be made from scientific principles and the woof from the customs and habits of the peoples in whatever region of the world they may be situated.

H. E. C. W.

## Special Articles

### THE EPIDEMIOLOGY OF LEPROSY\*

By JOHN LOWE, M.B., CH.B.

(Research Worker in Leprosy under the British Empire Leprosy Relief Association, the I. R. F. A., and the School of Tropical Medicine, Calcutta)

#### 1. Introduction

In this paper I attempt to outline in a general way some of the chief facts and theories regarding the epidemiology of leprosy. I am, however, not an epidemiologist, and also knowledge of this aspect of leprosy is not very extensive or accurate.

Epidemiological studies of leprosy are handicapped because statistics collected by health authorities, census officers, etc., are so inaccurate as often to be very misleading, and also because we have no test which indicates with any accuracy susceptibility or immunity to leprosy. The leprosy worker has to collect his own information and statistics by direct observation of the disease in the peoples affected.

The epidemiological study of any disease involves a study of its history. Leprosy is a disease which is constantly referred to in literature from the most ancient times to the present day, and from a study of these records classical scholars have tried to piece together a history of the disease. The following is an outline of this history based largely on that given in Rogers and Muir's *Leprosy*.

\* A paper read at the Public Health Society, Calcutta, 22nd January, 1937.

## 2. Outline of the history of leprosy

This outline is of doubtful accuracy. The disease possibly originated in Africa. In pre-historic times it spread to India and Egypt and a very early reference to it is in the Vedas dated about 1400 B.C. In the Eber's papyrus about 1550 B.C. there are descriptions of skin diseases under the names 'Uchedu', 'Chon's swellings' and 'Anut of Chon's swellings', the symptoms of which correspond very closely to those of leprosy. There is a questionable reference to it in the Egyptian records of 1350 B.C. in the reign of Rameses II. Munro reads the records as indicating the presence of leprosy in Negro slaves brought from the Sudan. Whether this reading is accurate or not, there is no doubt that in ancient as well as modern times invasions and the slave trade have been important factors in the spread of leprosy from one country to another.

Thus in very ancient times leprosy was common in Central Africa, India and possibly Egypt and in these areas it is common to this day.

From India leprosy spread eastwards. The oldest Chinese medical writings give no definite indication of its presence, but in the writings of about 100 to 200 B.C. there are definite references to leprosy.

From Egypt the disease spread round the eastern Mediterranean. The Jewish writings of the Bible contain many references to a disease 'Zaraath', which is described in some places in the Bible as being highly contagious, producing patches white as snow, and being fairly readily curable. Other references in the Bible indicate the incurability of leprosy. Possibly under the one term 'Zaraath' are included many skin diseases, such as psoriasis and leucoderma, as well as leprosy.

In 150 B.C. when the Jewish writings were translated into Greek, the word *Zaraath* was translated into the Greek term 'lepra' which is used in the Hippocratic writings for a scaly disease. It is probable that in the Hippocratic era there was no true leprosy in Greece for Hippocrates described no such disease, but Aristotle about 345 B.C. has references to the disease which may, therefore, have been found only in Asia Minor. Factors which may well have contributed to the spread of leprosy were the conquest of Egypt by Cambyses, 525 B.C., the conquests of Darius in the same century and later in 480 B.C. the conquests of Xerxes. According to Herodotus, Xerxes led 6,000,000 people from Asia into Europe, many thousands of whom remained in Europe. When true leprosy appeared in Greece the term 'lepra' was not applied to it but the term elephantiasis was used. The use of the word 'lepra' for what we now know as leprosy probably originated in a mistake in translation. In early medical writings in Arabic the term 'djudsum' is used for leprosy, and when these writings were

translated into Greek by Constantine of Carthage in the tenth century, the word 'lepra' was wrongly used, but the name has stuck. The Greek term for leprosy, elephantiasis, is still used in some medical writings and in Calcutta when the diagnosis has to be written without the patients or others knowing the initials E.G. (Elephantiasis Graecorum) are often used.

Leprosy was unrecorded in Roman writings until the time of Pompey, when it is recorded as having occurred in the soldiers returning from the East in 62 B.C. In Roman history from then onwards leprosy is often referred to. The Romans introduced leprosy into other parts of Europe. Galen wrote of it in Germany in A.D. 180 and Virchow reports that by A.D. 600 there were hundreds of leper houses in Italy and Germany. In the fifth and sixth centuries Spain was infected by Roman troops. After the fall of Rome, the conquest of Alaric and others probably helped to spread the disease. From Spain leprosy spread to France. (The Saracens invaded France from Spain early in the eighth century.) In 1757 laws were passed prohibiting the marriage of lepers and decreeing divorce of lepers.

Leprosy was probably introduced into England by the Romans. Sir G. Newman records that the first leper house in England was founded in Nottingham in the seventh century. The following are the dates of the establishment of the first leper houses:—Ireland 869, Wales 950, Scotland 1177 or 1300 (Newman). Meanwhile Norway was infected in 1266 and Shetlands, Faroe, Iceland, Greenland, Holland, Denmark, Sweden, Russia, the Baltic countries had also been infected.

Leprosy reached its height in Western Europe about 1200 though it was very common from A.D. 1000 to 1400 (2,000 leper houses in France alone). The influence of the Crusades on the incidence and the spread of leprosy has been discussed, but Newman thought that they only affected leprosy by impoverishing western Europe.

So far the story has been one of the introduction of leprosy into previously unaffected countries, and of its spread in such countries. In the thirteenth century, however, leprosy began to decline in Western Europe and by the seventeenth century it had more or less died out in this area excepting in a few persistent foci. The 'epidemic' in Europe had lasted about one thousand years.

The reasons for the dying out of leprosy in Western Europe have been discussed at great length by various writers, but no really satisfactory explanation has been given. Some students of the subject have considered that the isolation carried out in 'leper houses' was responsible (there were thousands of such institutions in medieval Europe). Climate and meteorological changes have recently been quoted as

important factors. Improved social and hygienic conditions and diet have been cited. A few writers have suggested that the Western European races gradually became immune because of the gradual dying out of the stock which was susceptible to leprosy. Other writers have considered that the tremendous mortality associated with the great plagues of the Middle Ages was an important factor. Some of these factors are discussed later. Other writers think that the reasons for the decline of leprosy in Europe are undetermined and possibly undeterminable, and quote similar phenomena seen in other diseases, such as tuberculosis and plague, such diseases dying out gradually or suddenly with no apparent cause, sometimes when conditions appear to be most favourable for their spread. One striking example of this is the steady decline in tuberculosis in England which began about 1800 just when the industrial revolution created conditions apparently favourable to its spread. This decline started long before the establishment of any organized anti-tuberculosis work.

I think we must admit that we have no satisfactory explanation of the decline of leprosy in Europe.

While leprosy was declining in Europe it was being conveyed to other previously uninfected countries: to North America and the West Indies by immigrants from Europe and by slaves from Africa, and to South America by immigrants from Spain. In South America leprosy is still widespread, but in North America there are only a few foci of leprosy.

Even within the last half century leprosy has been introduced into previously uninfected countries, chiefly Pacific Islands. The story of leprosy in Nauru is well known to students of leprosy. Leprosy was introduced and for some years spread very little. After the influenza epidemic of 1918 however (in which an incidence of 100 per cent and a mortality rate of 30 per cent were seen) leprosy spread widely and in a few years about 20 per cent of the population was affected, the disease, however, being in a comparatively mild form. The epidemic was short-lived and is now on the decline.

The history of leprosy is, on the whole, a history of endemicity of the disease in some parts of the world for thousands of years with its introduction from time to time into other parts where it may be seen in the form of very long period epidemics, dying out in time for no apparent reason.

### 3. *Transmission of leprosy*

This matter can only be discussed very briefly here. The only mode of transmission of leprosy about which there is any certainty is transmission by direct contact with infectious cases. Even so we do not know the exact way in which the bacilli get into the body, but most workers

consider that it is probably through abraded skin or through mucous membrane.

Transmission by contact with infected articles may be seen occasionally. It is extremely doubtful if the disease can be conveyed by infected air, water or food. Insect transmission appears on the whole to be improbable.

### 4. *The present distribution of leprosy in the world*

Leprosy is now regarded as a tropical disease and it is found chiefly in tropical countries but it still exists to a considerable extent in some non-tropical countries and, as will be clear from the history of leprosy which I have given, it used to be very prevalent in many non-tropical countries. The present distribution of leprosy in the world is shown roughly in the accompanying map I. Light shading indicates presence of leprosy but in small amount, less than 1 per mille. The more heavy shading indicates a moderate incidence of leprosy, probably between 1 and 2.5 per mille. The black portion indicates an incidence of leprosy of more than 2.5 per mille. In the black areas the incidence is usually from 5 to 10 per mille but in some areas, such as portions of Central Africa, the incidence may rise as high as 50 per mille. The map shows that the chief foci of leprosy are Africa, India, China and South America, that the heavily affected areas are nearly all in the tropics but that leprosy is found sometimes a long way from the tropics and even inside the Arctic circle, for example, Greenland, Iceland, Norway, the Baltic countries and Canada.

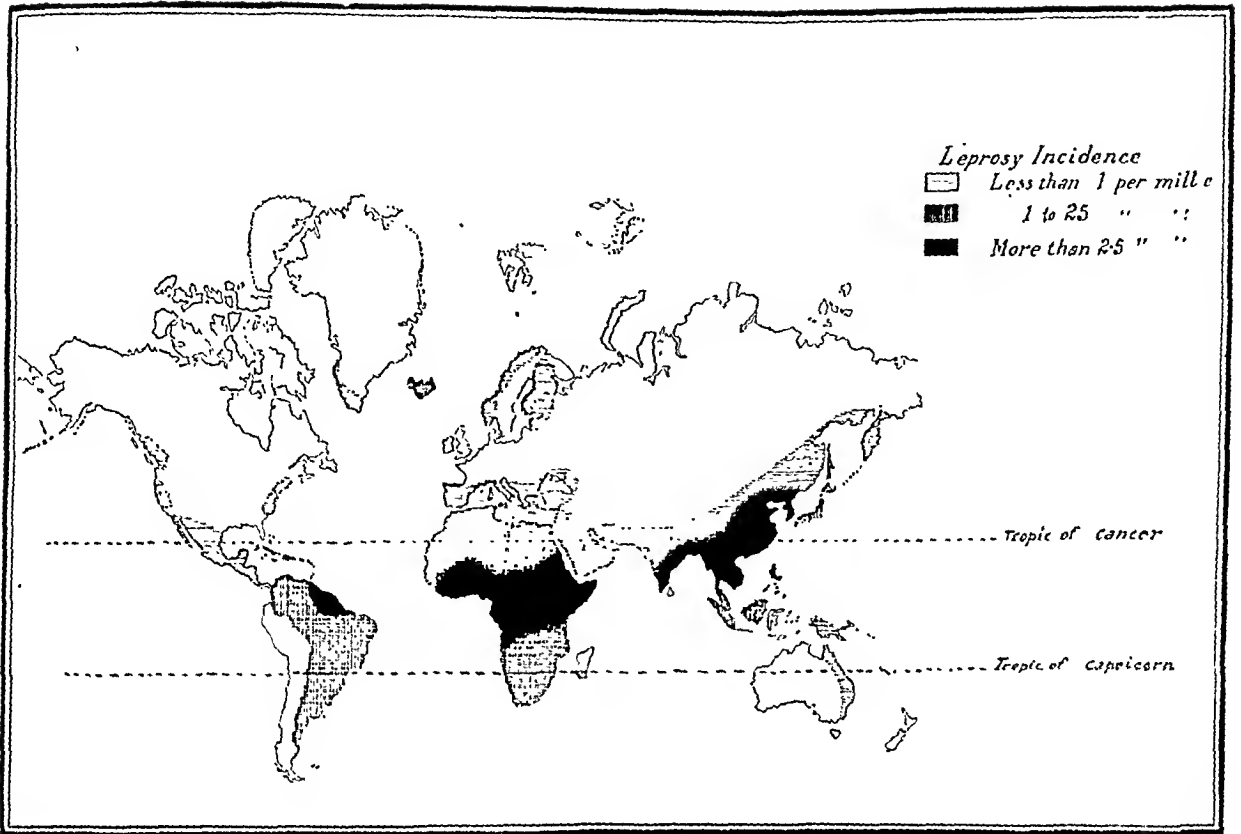
### 5. *Distribution of leprosy in India*

This is shown roughly in the accompanying map II. It will be seen that the areas with a high incidence are in the east and south, that central and western India and the Himalayan areas show a moderate incidence while the north-west of India is relatively free from leprosy. The most heavily affected areas are probably West Bengal, South Bihar, Orissa and Madras.

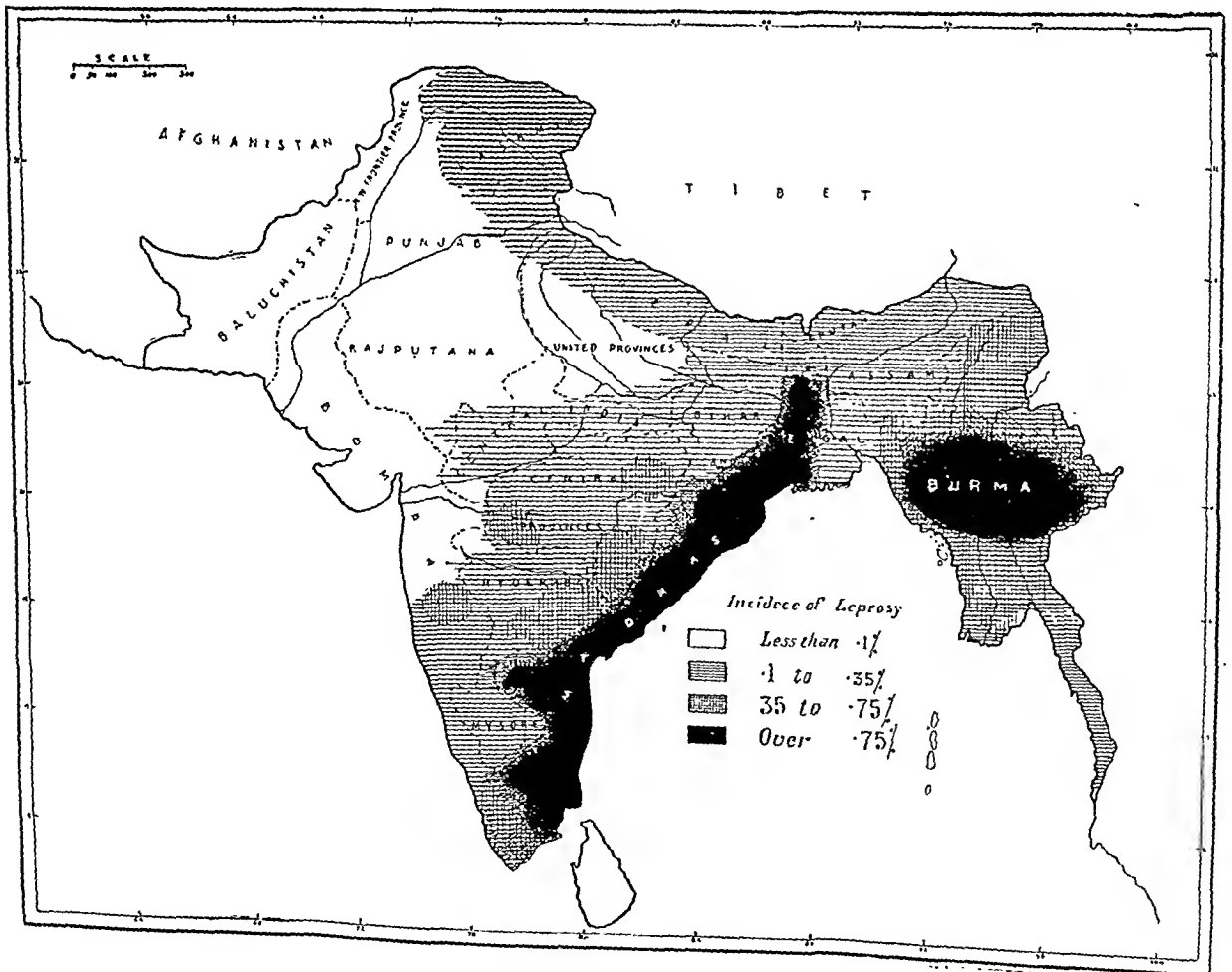
### 6. *Incidence*

Until about 10 years ago the only information regarding incidence of leprosy in India as a whole was that available in the decennial census, which in 1921 reported a total number of 102,000 cases of leprosy, giving an incidence of .35 per mille. The highest incidence reported in any area was about 1 per mille. During the last 10 years much leprosy survey work has been done in various parts of India and it is found that the census figure for many areas needs to be multiplied by a factor which varies between 3 and 20 and averages about 8. The census return for 1931 shows a figure of 147,911, an increase on the 1921 figure of 45,398. This increase possibly does not represent a real increase of leprosy but only an increase in the accuracy of the return. On the basis of our survey findings we have concluded that the

MAP 1

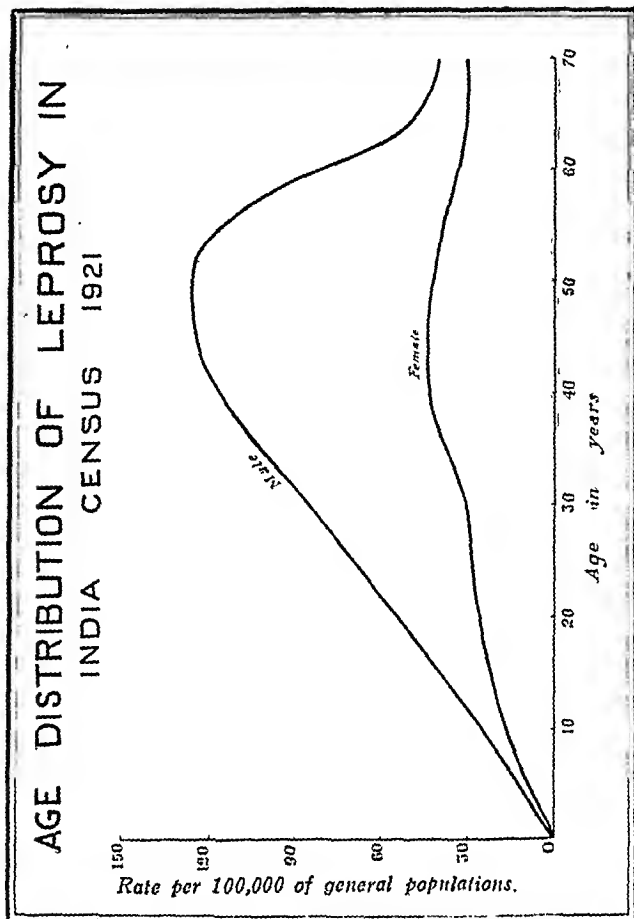


MAP 2

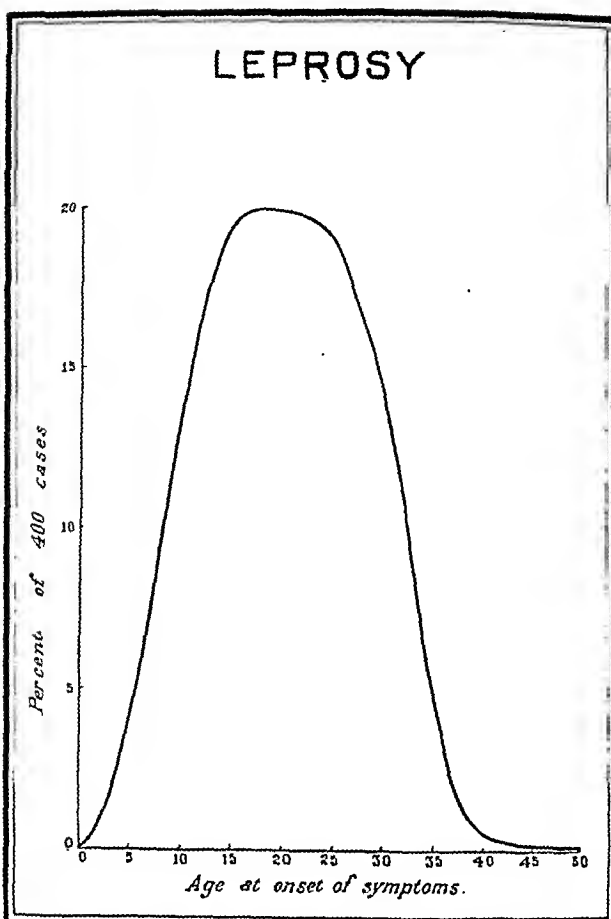




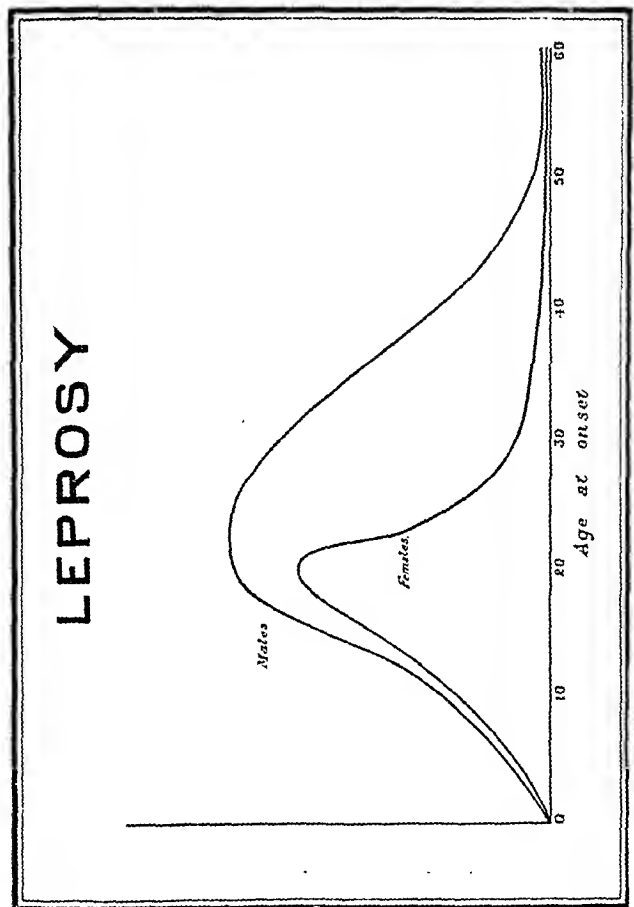
GRAPH 1



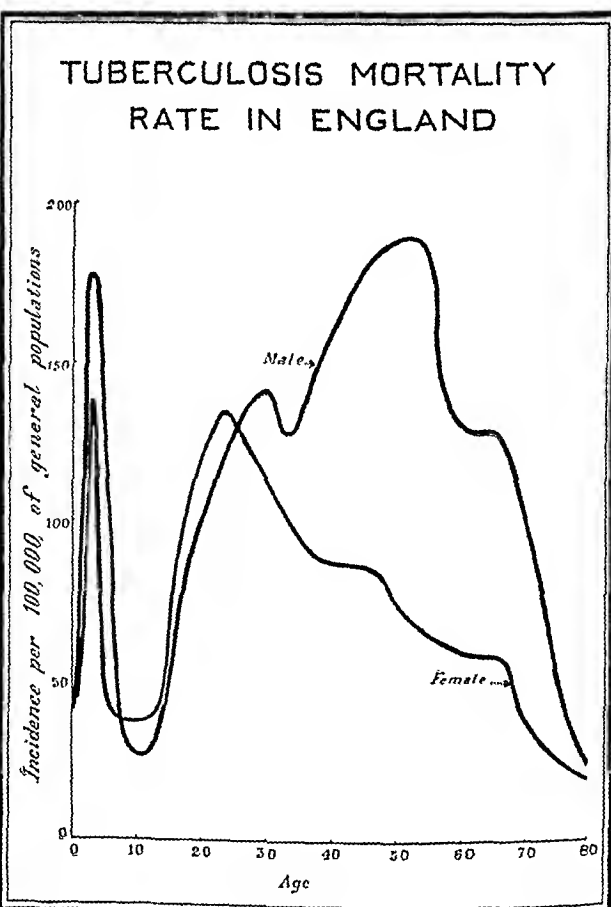
GRAPH 2



GRAPH 3



GRAPH 4



number of cases of leprosy in India is probably not less than one million. We find, in the heavily infected parts, large areas where the incidence may be 2 per cent of the population. We find small areas where the incidence is 5 or 7 per cent. We find villages in which the incidence is 15 or 20 per cent. It is on the basis of these survey figures that the accompanying map II has been made.

### 7. *Types of leprosy*

These high figures should however be explained a little. In survey work in India we find that on the whole there are about two relatively mild cases of leprosy to every severe case. In some of these mild cases, the disease is of little clinical or public health importance and in quoting these high figures these facts should be borne in mind.

### 8. *The age distribution of cases of leprosy*

The age distribution of cases of leprosy in India reported in the 1921 census is shown in the accompanying graph 1. The highest number of cases is found in the middle age periods. This graph is, however, of little value in indicating the age in which the disease is contracted because leprosy is a very chronic, often non-fatal, disease which exists for many years, and a middle aged or old person suffering from leprosy may often have contracted the disease quite early in life. An indication of the age at which the disease is contracted is given in graph 2 which gives the age at which the first symptoms were noticed, in 400 unselected cases of leprosy of all ages. It will be seen that in most of the cases the symptoms were recognized by the patient before the age of 30. Slight symptoms of leprosy may be present for years before they are recognized, and also the latent period of leprosy is long, averaging possibly three or four years, so that when these facts are taken into consideration, this graph indicates that the disease is probably contracted in the great majority of cases either in childhood, adolescence or early in adult life. The chances of the disease being contracted after the age of thirty are remote, though such cases are seen rarely. The difference in susceptibility at different ages is shown by a study of leprosy in families. Adults exposed to infection show an incidence of about 5 per cent, while children similarly exposed to infection show an incidence of 50 per cent or more. Another finding which is made from a study of leprosy at different age periods is that leprosy contracted early in life is far more likely to take a serious form than when contracted later in life.

### 9. *The sex incidence of leprosy*

It is a curious and interesting fact that in every country where leprosy is common the number of males suffering from the disease is much greater than the number of females, the proportion averaging about 2 to 1. It may be

thought that these returns are due to the difficulty of examining women properly, particularly in such countries as India, but I think there is no doubt that this is not so. Similar returns are made where there is no difficulty whatever in examining women. For example, in New Guinea, where males and females always wear the minimum of clothing and where the whole population is periodically examined naked for leprosy, the incidence in males is twice as high as in females. In the same area it is found that the disease also tends to take a milder form in females than in males. Similar findings have been reported in many other countries. It therefore appears to be quite definite that males suffer from leprosy more commonly and probably more severely than do females.

It is interesting to study the sex incidence at different age periods. This has been done in various centres. It is found that in the early years of life the incidence in the two sexes is about the same and in some countries it has been found that after the age of puberty the incidence in females may actually exceed the incidence in males. Shortly after puberty, however, the incidence in females reaches a peak and then tends to fall quickly, while at the same period the incidence in males continues to rise for several years and then falls but much more slowly. A graph of the sex incidence of leprosy at different age periods has the form shown (see graph 3).

It is very difficult to explain the difference in incidence and severity of leprosy in the two sexes. We might for a moment consider the question of the sister disease, tuberculosis. I have reproduced here a graph 4 made by McNalty indicating the mortality rate from tuberculosis, of the two sexes at different age periods in England. (McNalty considers that the mortality rate is the most reliable index of the incidence of tuberculosis in the two sexes.) In general outline (if we ignore the early peak due to infant mortality from tuberculosis) the curves are somewhat similar to those of leprosy, the incidence of tuberculosis in females is lower than that of males at all ages except the age of adolescence and the mortality rate is also lower. Now in tuberculosis this difference in sex incidence is probably due chiefly, if not entirely, to environmental factors, namely, greater exposure to infection and to factors which predispose to tuberculosis. This is caused chiefly by industrial conditions in England. Under other conditions the incidence of tuberculosis in the two sexes may be approximately equal; for example, in America, Robinson and Wilson investigated the incidence of tuberculosis in 20,000 industrial workers, 14,000 men and 6,000 women, and found that the incidence in women was slightly higher than in men. In India it is often said that tuberculosis is commoner in females than in males because of the unhealthy condition of seclusion in which many

women live. Therefore the reason for the difference in the sex incidence of tuberculosis is probably environmental. In leprosy, however, it is difficult or impossible to explain the lower incidence in women on this basis. Even in countries where men and women are equally exposed to infection the incidence in women is much lower.

It is a well-recognized fact that women are less susceptible to some diseases than men, but in no disease does this appear to be so marked as in leprosy. An interesting discussion on the sex incidence of the disease in general is given by Stallybrass in his book on epidemiology. I have made the following summary of this discussion :—

There are differences, sometimes quite marked, in the incidence and mortality of infectious diseases in the two sexes. Some diseases (*e.g.*, whooping cough and acute rheumatism) are reported as being more common in females, while others (*e.g.*, pneumonia and the middle-age form of tuberculosis) are more common in males. It is also noticeable that the sex incidence of disease often varies with age.

Nevertheless, at all age periods males show a greater incidence of infectious disease and a higher total mortality rate. This difference may be due to greater exposure or to greater susceptibility. Greater exposure may possibly explain the greater mortality in males in adult life, but it is difficult to see how it can explain greater mortality in childhood. Greater susceptibility in males may possibly be caused by sex differences; males are bigger and have a more developed musculature, which may throw a greater strain on the circulatory and excretory systems and so reduce chances of recovery when attacked. Again it is difficult to understand how this can explain the greater mortality in males in childhood.

The sex factor may be physiological rather than anatomical. The sex hormones are connected with differences in endocrine activity, as shown by the greater activity of the thyroid in women. The endocrine system is intimately connected with destruction of bacteria and their toxins. It is possible that differences in endocrine function in the two sexes may have an influence on the susceptibility to infectious diseases:

In addition to anatomical and physiological differences in the sexes there is the cytological difference. Each cell in the female contains a group of chromomeres different from the corresponding group present in the male, and it is this group that determines sex and sex differences.

Whether these anatomical, physiological, and cytological differences between the sexes have any effect on the sex incidence of disease is uncertain.

To summarize the findings regarding the incidence of leprosy in India, we find that the

incidence probably averages about 3 per mille but in some areas it is as high as 20 per mille, that about two-thirds of cases are relatively mild, that the disease is usually contracted in childhood or adolescence and that males suffer from the disease more commonly than females and tend to show a severer form of the disease.

#### 10. Race and leprosy

It has been suggested that the subsidence of leprosy in certain countries is due to the development of racial immunity due to a gradual dying out of the stock of the race which was susceptible to leprosy. This has been quoted as a possible reason why leprosy died out in Western Europe. Western European races have, however, at the present day no marked racial immunity to leprosy, since cases of leprosy occurring in such persons who go to countries where leprosy is endemic are not uncommon, and this is found in spite of the fact that such persons do not usually go to such countries until the age of the greatest susceptibility has passed. In India, for example, leprosy in Englishmen coming to the country in adult life is not so rare as one might imagine, and when such persons do develop leprosy the disease on the whole appears to take a rather severe form which would not indicate the presence of any marked immunity. It would appear that all races are susceptible to leprosy but there may be minor degrees of natural immunity. It is certainly true that leprosy shows itself rather differently in people of different races. In the Far East, the Philippines, Japan and Siam, for example, the disease appears on the whole to be more severe than it is in India, and also certain clinical manifestations of the disease which may be attributed to the relatively high resistance of Indians to leprosy are much more rarely seen in these Far Eastern countries. These differences may possibly be attributed to climatic and other factors but in countries such as Malaya or the West Indies where the population consists of different races—Chinese, Indian and Malayan, or Indian and African—leprosy appears to show itself in forms varying somewhat according to the race of the affected person. Here climatic and other differences are largely eliminated. It does appear, therefore, that there are some grounds for believing that there are minor degrees of racial immunity to leprosy. Regarding the nature of this immunity I cannot say anything here. The question has been raised as to whether racial immunity to leprosy may partly explain the distribution of leprosy in India. Do the races of the north-west suffer much less from leprosy because they have more racial immunity than the people of the south and east? This is a question which it is impossible to answer. However we find that leprosy is quite common among Punjabis and others who

have migrated to endemic areas such as Bengal, and when it occurs it may take a severe form.

### 11. *Climate and leprosy*

Climate affects leprosy in two ways. First of all it may affect the transmission of the disease and secondly it may influence the course of the disease. It is certainly noticeable that leprosy is most common in hot humid climates and it is possible that the humidity is of more importance than the temperature. A study of the maps of India and of the world which I have shown indicates how in dry parts, even in the tropics, leprosy is usually uncommon, whereas in moist parts of tropical and non-tropical countries leprosy may be more common. The reasons for this are not clear. One curious thing is that in some countries, where there is a considerable number of imported cases of leprosy, many of them infectious and few of them isolated, examples of such cases infecting others are extremely rare. For example, in England there are probably about 100 cases of leprosy, many of them infectious and many not isolated, but contact cases are extremely rare. The same thing is found in New York city. Climate may also have an effect on the disease and the experience of some physicians who have dealt with leprosy in tropical and in cold countries indicates that a cold country is not favourable for the treatment of leprosy. Thus the climate of countries such as England apparently does not favour transmission of the disease, but it does favour the development of the disease when it has risen.

### 12. *Diet*

There has, for centuries, been a common idea throughout the world that leprosy is influenced by diet. One of the common ideas in most countries, particularly in India, is that leprosy is connected with the eating of fish. Sir Jonathan Hutchinson took up this idea and gave it as an explanation as to why leprosy was so common in Europe in the Middle Ages when the eating of dried fish was very common, and why a high incidence of leprosy persisted so long among the fisher folk of Norway. Later he modified the idea and said that leprosy was due to eating decomposed fish and other bad food. This idea has now practically no adherents, for leprosy has been found to be common among people who never eat fish. It is, however, noticeable that leprosy does appear to be commoner among those peoples whose diet is ill-balanced. In China, for instance, the disease is much more common in parts where rice forms a staple part of the diet, and where protein, fat and vitamins are little taken. The same is true of India, leprosy being common among the rice-eating people of Bengal, Bihar, Orissa and Madras and less common among the people whose staple diet consists of wheat, *jawar* and other grains richer in protein. Leprosy is also

less common among those peoples in India who take milk or milk products. Similar findings have been made with regard to leprosy and diet in Africa. These things may however be pure coincidence. The difference in the incidence of leprosy in the different parts of India may be explainable on the grounds of racial, climatic and other differences and not of difference of diet. There is no doubt that a good diet is an important thing in the prevention of leprosy and in the treatment of leprosy; but the treatment of leprosy along dietetic lines only has, on the whole, given disappointing results.

### 13. *Social and hygienic conditions*

There is considerable evidence to show that the incidence of leprosy is markedly affected by social and hygienic conditions and that leprosy tends to die out when conditions are good. The improvement in social and hygienic conditions and diet is given by some as one of the reasons why leprosy died out in Western Europe, but the evidence to show that such very marked improvement occurred between the thirteenth and sixteenth centuries, the period during which leprosy died out, is not very strong.

It is interesting to compare the incidence of leprosy in people in the same country in different stages of civilization. In India, for example, leprosy up to the present has not been common among the aboriginals and semi-aboriginals who live on the whole a healthy out-door life in very small settlements and who, although they are extremely poor, not being vegetarians, often take a much more balanced diet than many other people of India. Also when cases of leprosy occur among them they are commonly ostracized and may be driven out of the community. Thus under primitive conditions in India leprosy is not common. The peoples in India who suffer most from leprosy are the outcastes, the low-caste Hindus and the poorer Mohammedans. I need not here discuss the social and economic conditions which are usually found in the poorer parts of an Indian village, and there seems to be no doubt that these conditions combined with a poor diet and chronic ill nourishment together with the effects of such infections as malaria, chronic dysentery and hookworm have an influence on the incidence of leprosy. We should not, however, imagine that leprosy in India is confined to the lower castes. In the higher castes and among people who have better social and hygienic conditions and who live in better houses and take better diet, the disease is certainly less common, but the disease is actually found in all classes of society in India, from the very highest to the lowest. Cases of leprosy servants infecting others living under good social conditions are far from rare, and it appears that even under the best conditions in India the presence of infectious cases is a very definite menace to healthy people, particularly young people and children.

If we try to correlate the incidence of leprosy in different parts of India with the general, social and economic conditions of the people we find it is not always easy. One of the poorest parts of India is undoubtedly West Bengal and here the incidence of leprosy is high, but it is certainly no higher than it is in some parts of Madras where on the whole the social and economic condition of the people is very much better.

The social and economic conditions of the people are of course intimately connected with diet, and many people do not take a better diet because they cannot afford it. However, a more wise use of the limited economic resources of a family would often improve the diet considerably, and a reduced consumption of carbohydrates and increased consumption of protein, fat and vitamin might render the people less susceptible to infectious diseases such as leprosy.

I think there is no doubt that in India there are two special factors which have an important bearing on the prevalence of leprosy. The first of these is religious sentiment which regards leprosy not as an infectious disease but as a visitation of the gods, a man's fate which cannot be avoided.

Religious sentiment also encourages the giving of alms to beggars, particularly lepers, as a religious duty. This fact encourages the wanderings of enormous numbers of lepers all over India, particularly to centres of religious pilgrimage, and because of this sentiment it is impossible to prevent lepers travelling on trains and public vehicles all over India, usually without any payment.

The second factor is the 'joint-family system' under which a father and mother and all the married sons and their families and all unmarried children share one household. If any member of the family gets leprosy in an infectious form, all the other members of the large joint family are exposed to the infection in the joint-family house, and numbers of them, chiefly children, frequently contract the disease in this way from relatives.

#### 14. Leprosy in rural and urban areas

Leprosy has up to the present been chiefly a rural problem since most of the people in India are agricultural workers living in villages. During recent years the opening up of previously secluded areas by the development of roads and railways, and the establishment of large industrial areas with large numbers of workers recruited from rural areas, have introduced a new aspect of the problem. Healthy workers from rural areas are migrating to industrial centres with their families, there getting infected with leprosy and later returning and spreading the disease in previously unaffected villages.

(Continued at foot of next column)

## ALLERGY

By DHARMENDRA, M.B., B.S.

*School of Tropical Medicine, Calcutta*

IN 1906 Wolff-Eisner suggested that human hypersensitiveness, as seen in hay fever, was related to the phenomenon of anaphylaxis in animals. Meltzer (1910) pointed out the similarity between the bronchial constriction in asthma and that seen in guinea-pigs dying of anaphylactic shock. He concluded that true bronchial asthma was anaphylactic in origin. After these observations all the clinical manifestations of idiosyncrasy were considered as anaphylactic. It was, however, gradually recognized that hypersensitiveness in human beings differed in many important aspects from the anaphylaxis as seen in lower animals. Various terms and classifications have been introduced to cover these differences. Von Pirquet (1911) after studying serum sickness coined the term *allergy* (from *εργον* energy and *αλλος* altered) meaning changed reactivity. He introduced the term allergy to indicate an altered reaction in man to foreign proteins and implied that an antigen-antibody reaction was its basis in general. Later on, Doerr extended the meaning of the term 'allergy' to include all forms of changed reaction to foreign proteins whether any antigen reaction was present or not. The term allergy is now being generally applied to the various forms of human hypersensitiveness exclusive of anaphylaxis in lower animals. Allergy has, thus, now come to mean 'exaggerated susceptibility to various foreign substances or physical agents that are harmless to the great majority of ordinary normal individuals'. The reaction appears after inhalation, ingestion, injection or skin contact of minute quantities of the particular substance and differs from any toxic action the substance might produce in large doses. This hypersensitiveness may be manifested at different sites in the body and these different manifestations are given different names. Thus in the respiratory tract

(Continued from previous column)

### Conclusion

These then are some facts and some theories regarding the epidemiology of leprosy in the world and in India. There are great gaps in our knowledge and the need for further study is obvious. There are three points which are clear and although they are elementary they need emphasis. Firstly, leprosy is an infectious disease though not highly infectious, and the conditions found in most parts of India are favourable to transmission. Secondly, while most adults are partly or completely immune to leprosy children are usually susceptible. Thirdly, the most important thing in the control of leprosy is the prevention of contact between infectious cases and children.

we have hay fever\*, paroxysmal rhinitis† and asthma‡; in the skin urticaria, giant urticaria, dermatographia, dermatitis venenata and certain forms of infantile eczemas and other skin eruptions; in the gastro-intestinal tract certain forms of gastritis, enteritis, mucous colitis and cyclical vomiting§ in children; in the nervous system certain cases of migraine and epilepsy; in the joints paroxysmal hydrarthrosis and possibly rheumatoid arthritis. Bray (1931) considers certain forms of enuresis in children of allergic origin.

### *Nature of allergy*

I do not propose to discuss the various chemical and physical theories which have been advanced from time to time to explain the ultimate cause of the reactions of anaphylaxis and allergy. The recent theory of Lewis (1927) is generally accepted to explain most of the facts. Lewis believes that the interaction of antigen and antibody in susceptible tissues brings about a liberation of the loosely-combined histamine normally present in the tissues and it is this liberated histamine which causes the ultimate effect. Dale (1929) considers such a conception to fit all known facts. Dale suggests that, although it is only the sensitized cells that react, the histamine might be liberated from the reacting cells themselves or anaphylactic injury of the cells of a large organ such as the liver might liberate histamine into the general circulation in such quantities as to produce the effects generally.

\* Hay fever is the term applied to paroxysmal sneezing, profuse watery discharge from the nose combined with nasal obstruction due to swelling of the mucosa, running from the eyes accompanied by severe itching of the mucous membrane of the nose, throat and palate occurring only at a certain season. The paroxysms are associated with the pollinating seasons of the trees, grasses or weeds to which the patient is hypersensitive. Outside this particular season he remains quite free from the effects.

† Paroxysmal rhinitis or spasmodic rhinorrhoea is the term applied to the condition in which the paroxysm of sneezing, nasal obstruction, running from the nose and eyes and itching, etc., are not confined to the pollinating season of any particular plant or plants but occur throughout the year whenever the patient comes in contact with the excitant. The excitants may include such substances as house or occupational dust, face and insect powders, animal emanations, powdered cereal grains, specific foods, drugs, incompletely broken up foods and toxins resulting from the bacterial action on such food, etc.

‡ It is to be clearly understood that all cases of asthma are not allergic in origin. Infection or disease of the respiratory tract (nose, throat, bronchi, bronchioles, etc.) and enlarged bronchial glands are responsible for a large number of cases of asthma amongst Indians.

§ Cyclical vomiting is a term applied to a malady amongst children characterized by lassitude, drowsiness, headache, fever, vomiting and marked muscular prostration. There is usually pain in the abdomen and constipation is generally present although in some cases there may be diarrhoea. The attacks begin at three or four years of age and continue at regular or irregular intervals up to 12 or 13 years of age.

*Mechanism of allergy.*—A number of attempts have been made by various investigators to demonstrate by means of passive transfer the presence of sensitizing antibodies in the blood of human allergies. The attempts to transfer the passive sensitiveness to guinea-pigs was attended with doubtful success. Prausnitz and Kustner thought of using the normal human skin, in place of the guinea-pig, for applying the method of passive transfer. They succeeded in passively and locally transferring fish-sensitiveness to the skin of an individual not sensitive to fish. Coca and Grove (1925) using this method demonstrated the passively-sensitizing property of the blood of all subjects of hay fever and asthma in whom the cutaneous reaction to the antigen was positive. These investigators studied the reacting properties of these sera and concluded that the sera contained a sensitizing body which was different in various respects from the anaphylactic antibody and gave it the name of 'atopic reagin'. These reagins have not yet been demonstrated in all the forms of human hypersensitiveness and Coca and others (1931) has offered a classification of hypersensitiveness\* taking this and other points into consideration. He divides human hypersensitiveness into four forms:—atopy (strange disease) in which the reagins in the blood are present and the condition is subject strictly to heredity; hypersensitiveness of infection in which the reagins have not been found—the condition results from infection and is not specially subject to heredity; contact dermatitis in which the reagins have not been demonstrated—the condition develops after contact with the excitant and is not subject to atopic hereditary influence; and ordinary serum disease with possibly an ordinary form of drug idiosyncrasy in which the reagins have not been demonstrated,—the condition develops during the course of contact with foreign proteins and is not subject to atopic hereditary influence.

The mechanism of hypersensitiveness to non-antigenic substances, such as metals, drugs and active principles of poison ivy and primrose, etc., was obscure till the recent work of Landsteiner and his co-workers. As early as in 1912 Wolff-Eisner in explaining this hypersensitiveness to non-antigens suggested the combination of the non-antigenic substance with the individual's own proteins producing a blood foreign protein which acted as an antigen. This theory was based on the investigation of Obermyer and Pick who in 1906 showed that antigenic specificity of the protein could be modified by nitration, diazotization or halogenation of the protein. The assumption of Wolff-Eisner has been justified by the work of Landsteiner and his co-workers. Landsteiner and van der Scheer (1929) showed that the steric configuration, as

\* He uses the term hypersensitiveness in its immunologic sense and excludes its general medical sense or the sense of increased reactivity.



well as the dominant chemical grouping, is an important factor in the specificity of the artificial antigens produced by linking a simple chemical substance of known structure to a protein. They prepared antigens by coupling the three isomeric tartaric acids (dextro, lævo and meso) with protein and the antisera prepared against these three artificial antigens which differed only in the steric configuration of the tartaric group exhibited only slight cross reactions. Goebel and Avery (1929) have further shown that when two simple carbohydrates, glucose and galactose,—which differ only in the steric configuration of a single carbon atom—are conjugated separately with the same protein, the antigens formed possess distinct specific characters. In this connection the observation of Whitfield (1921) is rather interesting as it tends to show the possibility of tissue protein to be so altered as to act as antigen. He cited cases of urticaria due to substances derived from a patient's own tissues. In his cases a blow on the skin or a fall produced a hæmatoma or ecchymosis without any breach of surface, nothing occurred for 10 days, at the end of which period there appeared a generalized, morbiliform, erythemato-urticarial eruption. The work of Manwaring and his co-workers in experimental anaphylaxis is very important in this respect. Manwaring, Hosepian, Enright and Porter (1925) produced evidence to show that canine anaphylaxis was due to chemical products explosively formed or liberated by the anaphylactic liver; these substances they called hepatic anaphylatoxin. Manwaring, Hosepian, O'Neill and Bing Moy (1925) produced further evidence of the existence of hepatic anaphylatoxins by cross-circulation, hepatic transplantation, and blood transfusion tests. Manwaring, Reeves, Bing Moy, Shumaker and Wright (1927) produced evidence to show that this hepatic anaphylatoxin must be regarded as a secondary antigen, presumably of protein nature and conceivably a denaturation product of the primary antigen explosively formed or liberated by the hyper-sensitive liver. Manwaring, Marino, McCleave and Boone (1927) produced further evidence to show that 'marked chemical alterations take place in specific antigens when injected into the animal body and that many of the essential immunologic adaptations are due to the resulting denaturation products (secondary antigens) rather than to the primary antigens originally injected'.

From what we have considered it is evident that in cases of allergy the offending substance or substances may be introduced into the body from outside or may be produced in the body itself. Thus, it may be inhaled as in hay fever, paroxysmal rhinitis, and pollen or dust asthma; it may be ingested as in food and drug allergy; it may be injected as in serum sickness; or it may be brought in contact with the skin or

mucous membranes as in dermatitis venenata and allergic conditions due to physical agents, such as heat, cold, light and mechanical irritation\*. A small group of allergic manifestations may be ascribed directly to insect bites and stings. When produced in the body the offending substances may originate in an infective process within the body, or it may owe its origin to some pathological condition of the gut. Altered tissue protein itself may act as an antigen. The secondary antigens which are produced in the body by the primary antigen as shown by Manwaring and his co-workers in dogs also come into this category. It appears that infective foci, whether of teeth, tonsils, sinuses, or bronchi, liberate a substance which circulates and sensitizes various tissues and is capable of producing symptoms in the skin, respiratory and gastro-intestinal tracts, joints, etc. In the cases secondary to some pathological condition of the gut the substance or substances in question result from the bacterial action on the protein, or the proteins are broken down in some abnormal fashion and the altered protein gains access to the circulation. In India the allergy secondary to some pathological condition of the gut is more important than any other form of allergy. This is probably due to a lowering of the defence mechanism of the liver in the tropics caused by amœbic or some other form of hepatitis. That the detoxicating and the proteopexic function of the liver is defective in cases of allergy was first shown by Barber and Oriel (1928) who found important biochemical changes in the blood and urine of allergics. Dharmendra and Napier (1935) tested the liver function by various tests in 38 cases of asthma and detected defective liver function in 34 cases by the lævulose test or the adrenalin test or by both.

*Allergic diathesis.*—There must be certain factors that make some individuals respond in an abnormal fashion to substances that are quite harmless to ordinary people. In other words, the potential allergic differs from the normal individual in some way. This difference or predisposition has been designated by such words as 'exudative diathesis', 'allergic disposition', 'allergic constitution' and 'allergic diathesis'. This 'allergic diathesis' cannot be explained by a single factor but there are various factors to be taken into account. Different factors predominate in the different cases or different groups of cases. We will briefly consider the important predisposing factors:

(1) Heredity. Heredity plays a most important rôle in a majority of cases. Nothing definite is so far known as to the nature of inheritance. Many writers ascribe the transmission to a special nervous build. Eppinger

\*Physical allergy is the term applied to allergic manifestations like urticaria, rhinitis, asthma, etc., when brought about specifically by a physical agent such as heat, cold, light and mechanical irritation acting on skin or mucous membrane.

and Hess consider the upsetting of balance between the vagal and the sympathetic constituents of the autonomic nervous system of primary importance. Endocrine dysfunction undoubtedly plays some part in bringing about the conditions and some writers believe glandular deficiencies to be directly or indirectly responsible for the transmission. It is difficult to say which of the two systems—the nervous or the endocrine—is of primary importance and influences the other since most of the glands are activated through the vago-sympathetic and on the other hand Burn (1933) found that the efficiency of the sympathetic nerve (that is, to say, the size of response elicited by a given impulse passing down a sympathetic nerve) depends upon the amount of adrenalin in circulation in the blood. The increased permeability of the endothelial system is another factor that can be transmitted. The question of a particular biochemical make-up being inherited looks an important one. Slight changes in the physico-chemical equilibrium of the body might be expected to lead to profound changes in its reaction to different circumstances.

(2) Since the excitants reach the tissues after absorption through the skin or the mucous membranes it seems reasonable to believe that abnormal permeability is one of the most important factors in bringing about protein hypersensitiveness by increasing the rate and amount of protein absorption. Schloss and Anderson (1922) produced evidence to show the enteric absorption of unaltered or slightly altered protein in marasmic infants with gastrointestinal disturbances. Anderson, Schloss and Myers (1925) showed that this enteric absorption took place in normal infants also but that the marasmic infants absorb much larger amounts and the absorption is continued over much larger periods than in the case of normal infants. Walzer (1927) has shown that in most persons unaltered food proteins enter the circulation in detectable amounts through the intestinal mucosa. It is quite conceivable that under altered conditions of permeability abnormal amounts of the unaltered food proteins enter the circulation. This has been actually shown to occur by Anderson, Schloss and Myers, as referred to above. O'Keefe (1927) is of opinion that there is definite and important relationship between the capillary circulation and allergic conditions, variations in capillary permeability affecting the amount and rate of protein absorption. Abnormal permeability may be an inherited factor or in the acquired cases it may be dependent on the excessive amount of histamine or allied poisons produced. Knott and Oriel (1930) have described in the sputa of asthmatics the presence of certain Gram-negative bacilli which during their growth within the small bronchial tubes give rise to histamine. Mellanby and Twort (1912) described the presence of

histamine in the intestinal wall and recovered a bacillus from the alimentary canal which converted histidine into histamine. Hanke and Koessler (1922 and 1924) found that histamine was a normal constituent of the large intestine of man and that this portion of the intestine normally contained micro-organisms that have the faculty of decarboxylating histidine into histamine and tyrosine into tyramine. It is quite conceivable that abnormal conditions in the intestines give rise to abnormal amounts of histamine and allied substances which alter the permeability. O'Keefe (1927) suggests that faulty digestion resulting in irritating intestinal contents might be expected to cause a change in the capillaries of the villi of the small intestine.

(3) The biochemical aspect. Important biochemical changes in the blood and urine are found during the attacks. Hurst suggested that in asthma there is some alteration in blood chemistry which renders an asthmatic subject liable to an attack of asthma from stimuli which in a normal person would produce no response. Barber and Oriel (1928) have found that the amino-acid content of the blood is raised during acute paroxysms of allergic manifestations and the whole blood chlorides seem to be markedly diminished. They pointed out the similarity of these blood findings to those of Haden and Orr in experimental intestinal obstruction. Haden and Orr concluded that the symptoms of toxæmia were due to proteoses absorbed through the damaged intestinal mucosa and that chloride was utilized to neutralize the toxic substances. In urine also, Barber and Oriel found important changes; immediately before and during the paroxysm there is a decrease in urinary output accompanied by a deposit of urates, an increase in free acidity and ammonia and a diminution in chloride excretion. During this period the urine gives a positive ether reaction for proteoses, to which they have attached a great importance. Following the paroxysm the quantity of the urine is increased and the urine becomes less acid or even alkaline and contains an excess of chlorides.

The calcium content of the serum and specially the calcium-potassium ratio has been widely investigated. It has been demonstrated that the effect of calcium and potassium on the cell was antagonistic, whereas calcium ions decrease nerve irritability potassium ions increase it. Some workers have reported low calcium contents of the blood in allergies but most investigators found no deviation from the normal figures.

*Liver dysfunction.*—The experimental work of Weil (1917), Weil and Eggleston (1917), and Manwaring (1921) demonstrated that the liver was the site of the anaphylactic reaction in dogs and that shock did not occur when the liver was thrown out of the circulation. It is very probable that liver dysfunction plays an

important part in the production of allergic symptoms in man, specially in allergy of intestinal origin. Osman (1929) suggested that in asthmatic children there is a diminution in glycogen reserve. O'Neill, Bing Moy and Manwaring (1925) found that glycogen disappears almost quantitatively from the canine liver during the first fifteen minutes of anaphylactic shock. McGuigan and Ross (1915) found a reduction of liver glycogen in peptone poisoning. It appears that the liver utilizes its glycogen to neutralize the toxins. The proteopexic function of the liver, i.e., its power of fixing proteins and its derivatives, also appears to depend on an adequate supply of glycogen. In the absence of an adequate supply of glycogen in the liver, the unneutralized toxins and the proteins tend to pass the barrier of the liver and gain access to the general circulation. If this inadequate proteopexic function is combined with a- or hypochlorhydria, which makes the absorption of proteins capable of producing sensitization more likely, the chances of such a protein reaching the circulation are much increased. The detoxicating function of the liver is concerned in transforming products of protein digestion into urea and in rendering non-toxic the products of bacterial action on undigested protein. The biochemical findings in the blood and urine of allergies provide ample evidence of a basic toxic factor in these conditions. The chief source of this intoxication is the bowel and the inadequate detoxicating function of the liver allows the toxins to pass into the general circulation.

#### *Disturbance in the acid-base equilibrium*

Before leaving the question of biochemical make-up as a predisposing factor in the allergic diathesis reference must be made to the disturbance in the acid-base equilibrium towards the alkaline side which has been found in the allergies. The importance of this disturbed balance lies in the fact that it has been shown that changes towards the alkaline side increase sensitiveness in a sensitized tissue and a change towards the acid side reduces the sensitivity. Hemingway (1926) has shown that slight changes towards the alkaline side in the perfusing fluid brought about exaggerated responses in the sensitized tissue and that the addition of hydrochloric acid reduces the sensitiveness. McDowall and Thornton (1930) demonstrated the effect of slight changes in the H-ion concentration of the perfusing fluid in isolated bronchial preparations. A slight change towards the acid side causes a dilatation of the bronchiolar muscles and an opposite change towards the alkaline side brings about a constriction. In accordance with this view, efforts have been made to treat the allergic conditions by giving dilute acids or acid diets or by making the patient inhale carbon dioxide or hydrochloric acid gas in definite concentration. Intravenous

injections of hydrochloric acid have also been advocated.

*Diagnosis of allergy.*—(1) History. In cases of suspected allergy it is essential to go carefully into the history of the patient. Well-planned and careful enquiries enable us to elicit many points of great diagnostic value. In taking the history the following points should be noted keeping the significance of each at the back of one's mind. Any additional questions that are suggested by the nature of the case should also be put to the patient:

(a) Age of onset. Most allergic conditions commence early in life. It is important to find out the age at which the patient first noticed the onset of the symptoms.

(b) A history of inheritance is commonly found in the allergic cases. It is not only the particular manifestation of allergy, say asthma, from which the patient suffers that is to be looked for in the near blood relatives, but a history of allergy in general should be sought.

(c) Season of onset and the seasonal variations in the disease are of importance. This may give a clue to the offending flowers, foods, etc.

(d) There is a regular periodicity in the early stages of the allergic conditions. When they are severe and persist for several years they tend to become continuous. The history of dyspnoea having been a continuous feature from the very beginning excludes the possibilities of a case being one of asthma.

(e) Association of the disease with some particular place, food, animal, or profession may be elicited. Particular attention should be paid to the surroundings at home and work, such as the presence of factories and stables near at hand, the presence of or association with pets and poultry, horses, or cows, the presence of pillow-cases stuffed with chicken feathers, etc. In this connection enquiry into any alteration in the circumstances, surroundings, diet, etc., immediately preceding the initial attacks will be of much help. The details of the early attacks, before repeated attacks introduce the secondary factor of infection, are similarly very helpful. Any factor which in the patient's opinion may be responsible for his symptoms should also be noted down. As regards food, at times the provocative article or articles of diet can be named by the patient but in the majority of cases he has to be carefully dieted before any food can be incriminated.

(f) The past history of the patient should be looked into. Enquiries should be made if the patient has suffered from allergic conditions, e.g., urticaria, angioneurotic oedema, hay fever, and food or drug hypersensitiveness. This might help in confirming or suggesting the diagnosis of the allergic nature of the ailment for which the patient is seeking advice. A history of having suffered badly from dysentery or digestive troubles is also very suggestive. In cases of asthma infections diseases of

the upper and lower respiratory tract should be enquired into.

(2) A total and differential blood count is made. Most allergic patients have a high blood eosinophilia.

(3) Protein skin tests are often of value in confirming the diagnosis when a careful history makes it possible to discover a specific substance responsible for the patient's symptoms. When no clue is afforded by the history at all, in doing these tests we are to be guided by the fact that food is responsible for most cases of hypersensitiveness in infants and babies. As age advances, the inhalant factor becomes more and more important and in adults this is responsible for most of the cases, food hypersensitiveness being rather rare at this age. Amongst the inhalants the dust extracts made from the sweepings collected from sleeping or office rooms, factories, or any other place where the patient spends most of his time is an important one\*.

These skin tests are based on the fact that those substances which, when inhaled, ingested, injected or taken into the body by any other means, are capable of producing allergic symptoms will also produce an urticarial weal when brought in contact with the lower layers of the skin.

The dermal tests are usually done on the forearm. The forearm is carefully cleansed with alcohol and scratches are made on it transverse to the long axis of the arm. The scratches are made only one-eighth of an inch in length and without drawing blood. One spare scratch is made to serve as a control. A drop of N/10 sodium hydroxide solution is put on each scratch and the substances to be tested are rubbed into them, one substance into one scratch, the control scratch receiving no substance. After about fifteen to twenty minutes the test fluid is wiped away and the results are read by comparing the site of each scratch with the control. A positive result is denoted by the appearance of an urticarial weal at the site of the scratch.

\* The following are the most common inhalant and ingested excitants:—

Inhalants: Pollens; hairs of horse, cat, dog, cow, and goat; feathers of chicken, duck or goose; dust from sleeping and working rooms, factories, etc.; face and insect powders, and fungi and moulds.

Ingestants: Wheat, corn, rice, egg, milk, fish, meat, potato, etc.

It is to be noted in connection with the cereals that they can act as excitants on being inhaled, ingested or touched. It may be that a cereal can be well tolerated on ingestion but not on inhalation or contact or *vice versa*. There are people who can eat wheat flour with impunity but handling the flour gives rise to a severe type of dermatitis and its inhalation itching of the nasal mucous membrane, sneezing and watery discharge. Similarly there are persons who can handle wheat flour without any bad effect but who cannot stand it as a diet.

The intradermal method is more delicate than the dermal or scratch test but may give rise to severe reactions. An intradermal test is made by injecting a minute quantity, not more than 0.01 c.cm., of the test fluid of known dilution into the most superficial layers of the skin. A positive reaction is shown by the formation of a weal, and an area of surrounding erythema within fifteen minutes. A delayed reaction, consisting of an indurated area at the site of injection, specially in the case of bacterial antigens, may develop within 24 hours.

The protein test can be performed on the mucous membranes instead of on the skin. The ophthalmic reaction is used in cases of pollen allergy. A minute quantity of the pollen solution is introduced into the conjunctival sac. A positive reaction is indicated by itching and redness at the inner canthus, or the whole eye may become red or swollen. The nasal reaction is tested by blowing or spraying the pollen dust into the nose. When the excitant is a food, an oral reaction might be elicited by applying the protein to the lips and the mouth swelling and blistering may be seen in a positive reaction.

The material for doing the dermal test can be obtained in the form of paste in collapsible tubes from Messrs. Parke, Davis and Company. The supernatant fluid obtained by macerating a small amount of the substance in a small quantity of N/10 sodium hydroxide can also be used for the test.

Extracts for use of intradermal testing and for subsequent desensitization if a specific sensitivity is found to be present are made as follows:—

The material is washed with ether to remove fatty matter and is extracted with Evan's alkaline buffered solution. The extracting fluid is kept in concentrated form in two solutions\*. For use, 100 c.cm. of each of these two solutions are mixed and made with distilled water to 1,000 c.cm. Toluol is used to prevent bacterial growth during the period of extraction. Toluol can be put as a thin layer on the top of the

#### \* Solution No. 1

NaCl	..	..	50.00 grammes
KH <sub>2</sub> PO <sub>4</sub>	..	..	3.63 "
Na <sub>2</sub> HPO <sub>4</sub>	..	..	14.31 "
Distilled water	..	..	1,000 c.cm.

#### Solution No. 2

Carbolic acid	..	..	4 per cent.
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† For extracting pollens and dust Coca's fluid may be used instead with advantage. The composition of the fluid is

NaCl	..	..	0.5 per cent
NaHCO <sub>3</sub>	..	..	0.275 "
Carbolic acid	..	..	0.4 "

Carbon dioxide is passed through it until phenolphthalein added to a sample of it remains colourless.

To avoid too great a dilution in extracting fruit and vegetable juice Coca suggests a stronger solution which he calls the preserving fluid one part of which is mixed with four parts of juice. The composition of this fluid is

NaCl	..	..	2.5 per cent
NaHCO <sub>3</sub>	..	..	1.25 "
Carbolic acid	..	..	2.0 "

fluid; with materials like flour it is better to mix toluol well with the dry substance before putting it in the extracting fluid. One to two days' extraction is quite sufficient. The extract is sterilized by passing through a Berkefeld type of filter. It should not be sterilized by boiling. The filtrate should be tested for sterility, both aerobically and anaerobically, before being used. The test should be performed with very weak dilutions to avoid undesirable effects. It is best to commence testing with a one-in-a-million dilution. One gramme of the substance is extracted with 100 c.c.m. of the extracting fluid, this gives a 1/100 dilution. Further dilutions of 1/1,000, 1/10,000, 1/100,000 and 1/1,000,000 are made from it.

4. Prausnitz-Kustner reaction. When it is not advisable or practicable to do the usual skin tests, as in infants, nervous patients, patients with extensive and interfering skin lesions or with extremely dermatographic skin, or where the patient cannot attend for testing on account of distance or illness Prausnitz-Kustner reaction is tested. It is an indirect test which is performed with the patient's serum using the forearm of a healthy person. The test consists in injecting a small quantity of the serum from an allergic patient intradermally into a non-sensitive subject and then testing the sites of injection—which have been passively sensitized—with antigens to which the allergic patient is thought to be sensitive.

Five to ten cubic centimetres of the blood are withdrawn from the patient and the serum is separated with aseptic precautions. The forearm of the subject on whom the test is to be done is cleansed with alcohol and the serum of the donor is injected at two or more sites depending on the number of proteins to be tested. About 0.1 cubic centimetre of the serum is used for each injection and the site of injection is marked with ink or marking pencil. At least two to three hours should be allowed for the serum to be completely absorbed. Then each site may be tested locally for specific proteins by the scratch method, keeping one site as a control.

5. The best proof of a substance being responsible for the allergic symptoms of a patient is that the substance when brought in contact with the patient should precipitate an attack and its removal should relieve the symptoms. Whenever possible the positive results of dermal or intradermal tests should be checked with this criterion. All positive reactions may not necessarily be true specific reactions. The use of very concentrated solutions or large amounts of solutions in the intracutaneous test and many other causes give rise to false positive reactions.

6. In most cases of allergy a hypodermic injection of 0.3 to 0.5 c.c. of a 1/1,000 solution of adrenalin hydrochloride relieves the symptoms and this forms a good therapeutic test.

7. A careful examination of the stools is made. The allergic cases secondary to gut infection may show an *Entamoeba histolytica* infection or the presence of ova of various helminths. The McConkey neutral-red lactose agar plate may show various non-lactose-fermenting bacilli, causing post-dysenteric lesions. These findings are rather important from the treatment point of view.

8. A bacteriological and cultural examination of sputum is made in cases of respiratory allergy keeping the Gram-negative bacilli of Knott and Oriel specially in view.

9. A thorough search is made for any focus of sepsis which may be present in teeth, tonsils, nose, sinuses, appendix, etc.

### *Treatment of allergy*

*Immediate treatment.*—Adrenalin hydrochloride is the most effective drug in relieving acute allergic symptoms. Usually 0.3 to 0.5 c.c.m. of a 1 in 1,000 solution is given subcutaneously. The earlier the injection is given the smaller is the dose required. Graesser and Rowe (1935) have used adrenalin inhalation to cut short the attacks in asthma. A 1 in 100 solution of adrenalin chloride is used in a specially made nebuliser. Adrenalin is not effective when given by mouth. Adrenalin or ephedrine is used in the form of solution, spray, or ointment to relieve the local nasal symptoms in allergic rhinitis. A simple 2 to 3 per cent solution of ephedrine in distilled water may be applied locally to nose and eyes. Adequate local treatment should be given for the skin, joints, etc.

The proper treatment of the condition depends on the results of the investigation of the patient.

I. If the history, skin reactions, or elimination diets give a clue to the specific sensitization, then the treatment can be carried out on the following lines:

(i) Avoidance or removal of the specific causes. This is the ideal method of treatment but is practicable only in a minority of cases. Foods that disagree may be eliminated and when the allergy is due to some occupational factor the occupation, if possible, should be changed. Pets can be removed and cotton can be used to stuff the pillows in place of feathers. It is very difficult to avoid dust and pollen unless a dust-free chamber or a face mask is used; residence in the hills above 4,000 feet high excludes most air-borne allergens.

Van Leeuwen (1924, 1927 and 1931) was the first to introduce a dust-free chamber into which filtered air was pumped for the treatment of asthmatic patients. Since the time of his first experiments he has introduced a number of modifications to simplify the apparatus. He reports the results of treatment in 1,000 cases of asthma treated in allergen-free chambers; 70 per cent of the cases remained free, 20 per cent improved, and 10 per cent were refractory to the treatment. Leopold and Leopold (1925) had a special room built in which not only was the air dust and pollen free, but temperature and humidity were controlled as well. Cohen (1927) introduced a portable mechanical filter, operated by electricity, which produced and maintained pollen-free air. The cost of all these is very high and they cannot be available for the use of an average patient. To remove this difficulty Peshkin and Beck (1930) introduced a new and simplified air-filter consisting of a cabinet, rectangular in shape, 25 inches wide, 15 inches high and 9 inches deep, which contains the film screen, a pressure fan and an electric motor (1/30 horse power).



The whole unit is so comprised as to fit into a window frame and the current consumption is very low. Rappaport, Nelson and Welker (1932) undertook an experiment to determine the effect of air filtration in hay fever and pollen asthma. Their results indicate that air filtration is very effective in relieving the symptom of hay fever but that cases of pollen asthma respond very slowly to it.

(ii) In cases where avoidance is impracticable, for example where sensitization to multiple foods exists or where it is not possible to change the occupation, the treatment lies in trying to desensitize the patient against the allergen. In effecting desensitization two routes are available :

(a) When the allergen is a common food specific desensitization may be attempted by oral administration of minute but gradually increasing doses of the food in question. The treatment is commenced with very small amounts of food, it is given daily, and the doses are increased very slowly. Bray reports better results if small doses of the food are given with hydrochloric acid and pepsin mixture.

(b) In cases of allergy due to dust, pollen, or animal emanations desensitization is carried out by repeated subcutaneous injections of the sterile extract made from the substance. The extract is put up in 1/100, 1/1,000, 1/10,000, 1/100,000 and 1/1,000,000 dilutions. By means of intradermal tests the lowest dilution to which the patient reacts is found out, using 0.01 c.cm. of the different dilutions at a time and beginning with the lowest one. The skin is tested with 1/1,000,000 dilution first; if no reaction is obtained in 5 to 10 minutes the 1/100,000 dilution is tested; and so on till a positive reaction is obtained. Treatment is commenced with 0.1 c.cm. of the dilution next lower to the one that gives a positive test; for example, if the patient reacts with a dilution of 1/10,000, the treatment is commenced with 0.1 c.cm. of a 1/100,000 dilution. Subsequent injections are given at four to seven days' intervals and the dosage is gradually increased according to the patient's reactions. The course of injection occupies from two to three months.

(3) Along with avoiding the cause or desensitization, the co-existing infections or abnormalities of the respiratory or the gastro-intestinal tract should be adequately treated.

(4) Drugs. Calcium is reported to have a favourable effect on allergic conditions. The blood-calcium value in allergic conditions, though reported to be low by some workers, has been found to be normal by most of the investigators, so that calcium is used only empirically in the treatment of these conditions. If used, calcium should always be given with parathyroid as otherwise it is not assimilated, 10 grains of calcium lactate with 1/10th grain parathyroid may be given first thing in the morning and last thing at night.

*Ephedrine* may be given orally to control the symptoms during the period when desensitization is being carried on. Half a grain of ephedrine sulphate or hydrochloride given morning and evening is often sufficient. This drug may sometimes give rise to untoward effects and has then to be cut down or totally omitted. The most common disagreeable symptoms that follow the use of the drug are palpitation, nervousness, and tremors, nausea, vomiting, sleeplessness and headache.

*Acids.* The use of nitro-hydrochloric acid as an adjuvant treatment in cases of allergy has recently been much advocated, specially in view of the disturbance in the acid-base equilibrium to the alkaline side that has been shown to occur amongst allergies. Bray gives 30 to 90 minim doses of acid hydrochlor. dil. (B. P.) three times a day before or with meals in orange or lemon juice.

II. A thorough investigation will often fail to incriminate any particular food or animal emanation. In such cases the treatment is to be carried out on the following lines:

1. In allergy of alimentary origin the antigen absorbed may not be a whole food protein but the proteins may be broken down in an abnormal fashion and the altered proteins pass up to a liver whose proteopexic function is deficient and thus gain access to the general circulation. Or the toxins liberated by the action of bacteria on incompletely digested proteins may be the cause of the conditions. In treating such cases at least four factors have to be taken into account—

(i) Any infection found in the gut has to be carefully treated, *Entamoeba histolytica* infection by emetine or carbarsone, and hookworm infection by tetrachlorethylene, or an auto-vaccine may be used to confer immunity against the pathogenic organisms isolated from the stools.

Intestinal stasis, if present, should be adequately treated. Kaolin together with an intestinal lubricant such as liquid paraffin has been used to prevent absorption of toxic substances from the intestines in cases of rheumatoid arthritis.

(ii) Acid-pepsin mixture is of great benefit when there is evidence of hypochlorhydria. This is specially useful in children as cases of allergy of alimentary origin are most common at this age.

(iii) The patient should be kept on a more-or-less vegetarian diet, meat and fish should be kept down to a minimum.

(iv) The liver should be well looked after. Adam recommends acid and liver mixture after meals and a weekly blue pill. Glucose has been found to be useful in allergic conditions by Osman (1929) and Cameron (1929). Glucose therapy affords the simplest and most rapid method of increasing the glycogen content of the liver, upon an adequate supply of which its



proteopexic and antitoxic functions have been shown to depend. Glucose has been found to be specially effective in the case of children; in adults it is not so useful. Barber and Oriel (1928) recommend 2 to 4 ounces of glucose to be taken daily in divided doses. Glucose may be taken with meals or dissolved in water and flavoured with orange or lemon juice; it can be taken morning and evening on an empty stomach.

2. A thorough search should be made for any focus of infection in the teeth, tonsils, sinuses, bronchi, etc. Infective foci which can be removed should be dealt with surgically\*. When the source of infection cannot be removed, an auto-vaccine prepared from the organisms isolated from the focus should be used. Special significance is attached to the vaccine prepared from the Gram-negative bacilli isolated from the sputum. Knott and Oriel (1930) found that these bacilli during their growth in the bronchi produce histamine. Oriel considers that local production of histamine in the bronchi in addition to causing a contraction of the plain muscles surrounding the bronchi would also tend to increase the permeability of the epithelium lining the bronchioles and facilitate the entrance of foreign proteins and possibly bacteria.

3. Non-specific protein therapy. The object of this form of treatment is to exhaust the sensitivity of the patient. Cecil (1935) thinks 'the most important function of the foreign protein reaction is the mobilization of immune bodies in the circulating blood'. Mackenzie and Fröhbauer (1927) have shown that in rabbits, which were previously injected with horse serum but in which the antibody to horse serum had disappeared, subsequent injections of chicken serum caused antibodies to horse serum to reappear. Petersen and others (1923) have shown that very small doses of peptone caused a lessened permeability of the endothelium. Hektoen (1935) believes that in the reaction to non-specific protein therapy important processes take place in the capillary walls and in the reticulo-endothelial system.

Protein therapy should not be used in the presence of active or quiescent pulmonary tuberculosis, cardiac or renal diseases, during pregnancy, in cases of exhaustion or in chronic alcoholics.

There are a number of substances which have been used for the purpose of non-specific therapy, e.g., peptone, serum peptone, proteoses, histamine, sulphur, autogenous blood, stock vaccines, auto-vaccines, tuberculin, gold salts, cobra venom and parasitic extracts.

4. The remarks about the use of calcium, ephedrine, and dilute hydrochloric acid as

adjuvants in the treatment given under the treatment of specific sensitivity apply here as well. In cases of allergy where an endocrine basis is suggested gland therapy may be of value. The suprarenals, thyroid and sex glands are most commonly involved. The desiccated glands may be given by mouth, but this procedure is only effective in the case of thyroid. Englebach (1932) has pointed out that only two of all the active principles of internal glands are effective when given by mouth. These two are thyroid and emmenin which are extracted from human placenta. In cases where hypoadrenia is apparent Bray gives ephedrine by mouth regularly. In patients in whom some definite relationship exists between their asthmatic attack and menstrual periods the attacks have been prevented by injections of corpus luteum. Injections of arsenical preparations such as soamin are used to tone up the endocrine system.

### SUMMARY

#### *Manifestations of allergy*

Respiratory tract: hay fever, paroxysmal rhinitis and asthma.

Skin: urticaria, giant urticaria, dermatographia, dermatitis venenata, certain forms of eczemas and a variety of skin eruptions.

Gastro-intestinal tract: certain forms of gastritis, enteritis, mucous colitis and cyclical vomiting.

Nervous system: certain cases of migraine and epilepsy.

Joints: Paroxysmal hydrarthrosis and rheumatoid arthritis.

Urino-genital system: certain forms of enuresis in children.

#### *Diagnosis of allergy*

1. A history of inheritance is usually present.
2. The disease usually comes on early in life.
3. There may be an association of the disease with particular place, food, animals, pollens, etc.
4. There is a definite periodicity in the early stages of the allergic conditions.
5. There is usually high blood eosinophilia.
6. Protein skin tests may be positive to some excitants. Indirect skin test, i.e., the Prausnitz-Kustner reaction may be positive.
7. The best proof of a substance being responsible for the allergic symptoms of a patient is that the substance when brought in contact with the patient precipitates an attack and its removal relieves the symptoms.
8. A hypodermic injection of 0.3 to 0.5 c.cm. of a 1 in 1,000 solution of adrenalin chloride relieves the symptoms in most cases of allergy.

#### *Treatment of allergy*

The acute symptoms are relieved by a hypodermic injection of a 1 in 1,000 solution of adrenalin chloride. Inhalation of a 1 in 100 solution of adrenalin chloride in a special inhaler is useful to cut short the attacks of

\* Operative measures on the nose, tonsils and sinuses, etc., are not always successful, because the conditions calling for the operation may not be the cause of allergy.

asthma. Ointments and sprays containing adrenalin and ephedrine are of value in the local treatment of the nose and a solution of ephedrine in distilled water is efficacious for local treatment of the allergic conditions of the eyes.

The treatment between the attacks—

1. If any clue is found to the specific antigen—

(a) avoid or remove the specific cause, or  
(b) desensitize the patient with pollen, dust or epidermal extracts or with minute quantities of the food, etc., as the case may be, and  
(c) along with avoiding the cause or desensitizing the patient any co-existing infections or abnormalities of the respiratory or gastrointestinal tract should be adequately treated. Any evident endocrine dysfunction should be attended to. Calcium, ephedrine and dilute hydrochloric acid can be used in suitable cases.

2. If no clue is found to the specific antigen.  
(1) In cases of gut origin—  
(a) any infection found in the gut should be carefully treated,  
(b) an acid-pepsin mixture is of great benefit when there is an evidence of hypochlorhydria,  
(c) the patient should be kept on a more-or-less vegetarian diet, and  
(d) liver should be well looked after; 2 to 4 ounces of glucose taken daily in divided doses are very efficacious in children.

(2) A thorough search should be made for any focus of infection and, if present, it should be adequately treated surgically by means of auto-vaccines.

3. Non-specific desensitization may be tried with peptone, serum peptone, auto-hæmotherapy, milk, sulphur, tuberculin, T.A.B. vaccine, etc.

4. Endocrine therapy may be tried in suitable cases. Calcium, ephedrine and dilute hydrochloric acid may be used in some cases.

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## Medical News

### ROYAL LONDON OPHTHALMIC HOSPITAL

('MOORFIELDS')

*Medical School (University of London)*

It is probable that during the time of the Coronation some old students of Moorfields, from overseas, will be in London. The Dean of the Medical School, Royal London Ophthalmic Hospital, is, therefore, preparing a short series of demonstrations that they may like to attend, and the following programme is being arranged:—

1. Exhibition of ophthalmoscopic conditions. Tuesday, 4th May, at 5-30 p.m.
2. Exhibition of slit-lamp cases. Thursday, 6th May, at 5-30 p.m.
3. Operation demonstrations: (a) Cataract.  
(b) Glaucoma.  
(c) Detachment.  
(d) Squint.

- A selection of the above on the mornings of
- |                     |
|---------------------|
| Monday, 3rd May.    |
| Wednesday, 5th May. |
| Friday, 7th May.    |
4. Orthoptics .. .. Tuesday, 4th May, at 10 a.m.
  5. Pathological exhibitions .. Wednesday, 5th May, at 5-30 p.m.

The Dean informs us that they will be pleased to welcome any of their friends, and it would make arrangements easier if they would be so good as to send him notice of their intention to attend the course.

### THE XIII ALL-INDIA MEDICAL CONFERENCE, 1936, KARACHI

We give below some of the more important resolutions passed at the conference:—

This conference is of opinion that there is an urgent and vital need of passing legislation in the shape of a *Pure Drug Act and Pharmacy Act* for British India, on the lines of that of United States of America, for the purpose of controlling the sale of drugs, as well as laying down the qualifications of the dispensers of drugs.

(a) This conference calls the attention of the medical profession, the government and municipalities to the urgent need of research in causes of malnutrition of the poor people of India and into the dietaries in various parts of India, and for the standardization of 'balanced diets' in different provinces, in accordance with the local dietetic customs of the people and the foods available during different seasons of the year.

(b) This conference desires to draw the attention of the government and the leaders of India to the fact that deficiency anæmias and diseases, tuberculosis, rickets, dental caries, infectious diseases, etc., spring from malnutrition. That the problem of prevention of diseases is partly a problem of the provision of sufficient and nutritious food for the people.

Whereas tuberculosis or white plague is insidiously making rapid inroads into populous cities in India and is responsible for high mortality incidence as shown by the vital statistics of the prominent municipal bodies in the country,

And whereas the disease is more or less endemic among the poorer section of the community and particularly among the children of school-going age whose parents and guardians can ill-afford to supply them with adequate amount of nourishing food like milk, fruits and eggs,

And whereas these children grow up poor in vitality with low resisting power which makes them more susceptible to tuberculous infection at this tender age,

This conference strongly urges upon various local bodies, district and local boards, educational institutions, government and private, carefully to collect the statistics of the disease in their respective jurisdictions, especially amongst children of school-going age, and inaugurate schemes of free milk supply to deserving children of poor parentage in humbler quarters of the cities, to provide them with adequate nutrition to fortify their constitution against the fell disease. The conference confidently hopes that such schemes, if earnestly pushed forward and assiduously carried out, will succeed in their object of building up healthy generation of manhood and womanhood.

This conference resolves that in view of the exhibition of obscene and indecent advertisement by means of newspapers, bills, and posters regarding medicines which are a nuisance and detrimental to the health of the public, particularly the young inexperienced girls and boys, the central and local governments and the local bodies be requested to take strong action to stop it.

Resolved that the government be requested to make the scheme for periodic health examination of school children compulsory and steps be taken for the preparation of a suitable scheme for the training of medical men for the purpose.

This conference requests the Government of India:—

(a) to amend the Indian Medical Degrees Act of 1916 in such a way as to make it unlawful for the unqualified persons to write any letters or words, with their names which may denote in a direct or indirect way the resemblance of these letters or words to be genuine or *bona fide* medical degrees, and

(b) to declare it an unlawful practice for such unqualified persons to place or write the designation of 'doctor' before their names.

This conference views with great concern the recent influx of a large number of doctors from foreign countries with which there does not exist any reciprocity and requests the government to take necessary measures to prevent such influx.

Resolved that in the opinion of this conference, registered medical practitioners should not have any connection with unaffiliated institutions for the teaching of the Western scientific system of medicine.

Resolved that this conference requests the government to initiate legislation to prevent any individual or corporate body to start or run any institution for the teaching of the Western scientific system of medicine, until such an individual or body satisfy some preliminary minimum requirements to be prescribed by the provincial medical councils.

Resolved that this conference views with alarm the rapid increase of 'open chemists' shops' owned and managed by the registered medical practitioners where consultation may be obtained free by all classes of people irrespective of their income or position in society.

Resolved further that this conference is of opinion that it should be declared unethical for registered medical practitioners to have any connection with an open shop where prescriptions other than his own or of other registered medical practitioners are served.

Resolved that this conference views with concern the growing tendency of the well-to-do and middle class public of utilizing free hospital facilities and thereby shutting out from the hospitals some of the poorer section of the public for whom such facilities are primarily intended and depriving the general practitioners of their legitimate income and experience.

Resolved that the Indian Medical Association be requested to take active and early steps to remedy the above state of affairs.

Resolved that this conference notes with regret the policy of some of the teaching institutions (official and non-official) in permitting their staff in charge of beds to hold positions in more than one teaching institution, leading to a state of affairs which is detrimental to the efficiency of the institutions.

Resolution:—

(a) Rural medical relief and sanitation being intimately connected with any scheme of village

reconstruction as fundamentally affecting the economic prosperity of a predominantly agricultural country like India, this conference is strongly of opinion that the Government of India and the provincial governments in the coming autonomous provinces should revise their public health policy in its essential aspects and give proper attention to it in their annual budgets.

(b) In provinces like Sind and the Punjab and others, where irrigation projects of immense importance and great magnitude have been launched and vast areas of land are under water for greater part of the year, this conference notes with regret that no adequate sanitary or drainage arrangements have been provided *pari passu* with the irrigation schemes. This deplorable state of affairs has resulted in unprecedented water-logging of such areas with consequent high malarial morbidity and mortality which has undermined the health of the countryside with considerable loss of man-power and economic ruination.

(c) While recording its sense of appreciation of the recognition, none too early, by the government of the paramount importance of rural reconstruction and the provision of the funds, however inadequate, in the central budget for the purpose, this conference is emphatically of opinion that such half-hearted measures will not touch even the fringe of the problem. It urges the governments, central as well as provincial, to make public health in the village reorganization the first charge on the state revenue; to set up sufficient rural dispensaries under qualified hands; to organize health and sanitation committees, child and maternity welfare centres and provide training facilities for *dais*; to undertake drainage and sanitary schemes in water-logged areas, and to push antimalarial measures with all the vigour and liberalize the quinine policy.

This conference is of opinion that the medical schools of the present day have outlived their usefulness and should either be brought in conformity with the minimum requirements laid down by the Indian Medical Council or be closed down without any further delay.

### THE INDIAN HONOURS LIST

1ST FEBRUARY, 1937

The following are the names of medical workers in the Indian Honours List of 1st February, 1937. We offer them our congratulations—

#### C.I.E.

Lieutenant-Colonel R. E. Flowerdew, I.M.S., Inspector-General of Prisons, Bengal.

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M. D. R. David, Third Surgeon, General Hospital, and Police Surgeon, Rangoon.

Major H. C. Phillips, I.M.D., Superintendent of the Punjab Vaccine Institute, Lahore.

E. Duckworth, I.M.D., Manager, Medical Store Depot, Lahore Cantonment.

#### C.B.

Major-General A. W. M. Harvey, I.M.S., Deputy Director of Medical Services, Northern Command.

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Lieutenant-Colonel G. B. Hanna, I.M.S., Officer Commanding Indian Military Hospital, Quetta.

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(First Class)

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Lieutenant-Colonel G. M. Millar, I.M.S. (retired), Director, Medical Services, Jammu and Kashmir State.

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#### Kaiser-i-Hind Medal

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Mrs. E. F. Lethbridge, Lady Doctor at Kamaran, Quarantine Station, Aden.

Mrs. A. F. Morgan, Matron, Indian Hospital, Khargpur.

Miss M. O'Neill, Matron, Dai Khana, Ajmer-Merwara.

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Dr. J. A. M. Smith, Missionary, Church of Scotland Mission, Kalimpong, Bengal.

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Dr. S. A. H. Jafri, Bengal.

#### Rai Bahadur

Rai Sahib Dr. B. B. Mullick, Saran, Bihar.

Jemadar P. Bali, I.M.D., Sub-Assistant Surgeon, Cantonment General Hospital, Rawalpindi.

H. A. Shumshuddin Sahib Bahadur, Unani Doctor, Mayavaram, Tanjore District, Madras.

#### Rai Sahib

Dr. N. Pal, Patna Medical College Hospital, Patna.

Subedar K. C. Kapur, I.M.D., Fort Sandeman, Baluchistan.

Captain D. Shluwuliu, I.M.S., Bundi State, Rajputana.

### MEDICAL COUNCIL OF INDIA

The Seventh Session of the Medical Council of India was held on 12th February, 1937, in the Imperial Secretariat, New Delhi, 27 members being present, with Major-General Sir Cuthbert Sprawson in the chair.

The president, in his address, reviewed the activities of the council and on the eve of his retirement while wishing good-bye expressed satisfaction on its achievements.

A motion of condolence with the widow of the late Colonel H. H. Thorburn who represented the North-West Frontier Province Government on the council was adopted, all standing.

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The following members were re-elected to the executive committee of the council:—

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The council considered the question of the recognition of foreign medical degrees of repute when held by Indian nationals. The council was of opinion that Indian nationals who have obtained medical qualifications of repute in foreign countries should not be

proteopexic and antitoxic functions have been shown to depend. Glucose has been found to be specially effective in the case of children; in adults it is not so useful. Barber and Oriel (1928) recommend 2 to 4 ounces of glucose to be taken daily in divided doses. Glucose may be taken with meals or dissolved in water and flavoured with orange or lemon juice; it can be taken morning and evening on an empty stomach.

2. A thorough search should be made for any focus of infection in the teeth, tonsils, sinuses, bronchi, etc. Infective foci which can be removed should be dealt with surgically\*. When the source of infection cannot be removed, an auto-vaccine prepared from the organisms isolated from the focus should be used. Special significance is attached to the vaccine prepared from the Gram-negative bacilli isolated from the sputum. Knott and Oriel (1930) found that these bacilli during their growth in the bronchi produce histamine. Oriel considers that local production of histamine in the bronchi in addition to causing a contraction of the plain muscles surrounding the bronchi would also tend to increase the permeability of the epithelium lining the bronchioles and facilitate the entrance of foreign proteins and possibly bacteria.

3. Non-specific protein therapy. The object of this form of treatment is to exhaust the sensitivity of the patient. Cecil (1935) thinks 'the most important function of the foreign protein reaction is the mobilization of immune bodies in the circulating blood'. Mackenzie and Fröhbauer (1927) have shown that in rabbits, which were previously injected with horse serum but in which the antibody to horse serum had disappeared, subsequent injections of chicken serum caused antibodies to horse serum to reappear. Petersen and others (1923) have shown that very small doses of peptone caused a lessened permeability of the endothelium. Hektoen (1935) believes that in the reaction to non-specific protein therapy important processes take place in the capillary walls and in the reticulo-endothelial system.

Protein therapy should not be used in the presence of active or quiescent pulmonary tuberculosis, cardiac or renal diseases, during pregnancy, in cases of exhaustion or in chronic alcoholics.

There are a number of substances which have been used for the purpose of non-specific therapy, e.g., peptone, serum peptone, proteoses, histamine, sulphur, autogenous blood, stock vaccines, auto-vaccines, tuberculin, gold salts, cobra venom and parasitic extracts.

4. The remarks about the use of calcium, ephedrine, and dilute hydrochloric acid as

adjuvants in the treatment given under the treatment of specific sensitivity apply here as well. In cases of allergy where an endocrine basis is suggested gland therapy may be of value. The suprarenals, thyroid and sex glands are most commonly involved. The desiccated glands may be given by mouth, but this procedure is only effective in the case of thyroid. Englebach (1932) has pointed out that only two of all the active principles of internal glands are effective when given by mouth. These two are thyroid and emmenin which are extracted from human placenta. In cases where hypoadrenia is apparent Bray gives ephedrine by mouth regularly. In patients in whom some definite relationship exists between their asthmatic attack and menstrual periods the attacks have been prevented by injections of corpus luteum. Injections of arsenical preparations such as soamin are used to tone up the endocrine system.

#### SUMMARY

##### *Manifestations of allergy*

Respiratory tract: hay fever, paroxysmal rhinitis and asthma.

Skin: urticaria, giant urticaria, dermatographia, dermatitis venenata, certain forms of eczemas and a variety of skin eruptions.

Gastro-intestinal tract: certain forms of gastritis, enteritis, mucous colitis and cyclical vomiting.

Nervous system: certain cases of migraine and epilepsy.

Joints: Paroxysmal hydrarthrosis and rheumatoid arthritis.

Urino-genital system: certain forms of enuresis in children.

##### *Diagnosis of allergy*

1. A history of inheritance is usually present.
2. The disease usually comes on early in life.
3. There may be an association of the disease with particular place, food, animals, pollens, etc.
4. There is a definite periodicity in the early stages of the allergic conditions.
5. There is usually high blood eosinophilia.
6. Protein skin tests may be positive to some excitants. Indirect skin test, i.e., the Prausnitz-Kustner reaction may be positive.
7. The best proof of a substance being responsible for the allergic symptoms of a patient is that the substance when brought in contact with the patient precipitates an attack and its removal relieves the symptoms.
8. A hypodermic injection of 0.3 to 0.5 c.cm. of a 1 in 1,000 solution of adrenalin chloride relieves the symptoms in most cases of allergy.

##### *Treatment of allergy*

The acute symptoms are relieved by a hypodermic injection of a 1 in 1,000 solution of adrenalin chloride. Inhalation of a 1 in 100 solution of adrenalin chloride in a special inhaler is useful to cut short the attacks of

\* Operative measures on the nose, tonsils and sinuses, etc., are not always successful, because the conditions calling for the operation may not be the cause of allergy.



asthma. Ointments and sprays containing adrenalin and ephedrine are of value in the local treatment of the nose and a solution of ephedrine in distilled water is efficacious for local treatment of the allergic conditions of the eyes.

The treatment between the attacks—

1. If any clue is found to the specific antigen—

(a) avoid or remove the specific cause, or

(b) desensitize the patient with pollen, dust or epidermal extracts or with minute quantities of the food, etc., as the case may be, and

(c) along with avoiding the cause or desensitizing the patient any co-existing infections or abnormalities of the respiratory or gastrointestinal tract should be adequately treated. Any evident endocrine dysfunction should be attended to. Calcium, ephedrine and dilute hydrochloric acid can be used in suitable cases.

2. If no clue is found to the specific antigen.

(1) In cases of gut origin—

(a) any infection found in the gut should be carefully treated,

(b) an acid-pepsin mixture is of great benefit when there is an evidence of hypochlorhydria,

(c) the patient should be kept on a more-or-less vegetarian diet, and

(d) liver should be well looked after; 2 to 4 ounces of glucose taken daily in divided doses are very efficacious in children.

(2) A thorough search should be made for any focus of infection and, if present, it should be adequately treated surgically by means of auto-vaccines.

3. Non-specific desensitization may be tried with peptone, serum peptone, auto-hæmotherapy, milk, sulphur, tuberculin, T.A.B. vaccine, etc.

4. Endocrine therapy may be tried in suitable cases. Calcium, ephedrine and dilute hydrochloric acid may be used in some cases.

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## Medical News

### ROYAL LONDON OPHTHALMIC HOSPITAL

('MOORFIELDS')

*Medical School (University of London)*

It is probable that during the time of the Coronation some old students of Moorfields, from overseas, will be in London. The Dean of the Medical School, Royal London Ophthalmic Hospital, is, therefore, preparing a short series of demonstrations that they may like to attend, and the following programme is being arranged:—

1. Exhibition of ophthalmoscopic conditions. Tuesday, 4th May, at 5-30 p.m.
2. Exhibition of slit-lamp cases. Thursday, 6th May, at 5-30 p.m.
3. Operation demonstrations: (a) Cataract.  
(b) Glaucoma.  
(c) Detachment.  
(d) Squint.

A selection of the above on the mornings of Monday, 3rd May.  
Wednesday, 5th May.  
Friday, 7th May.

4. Orthoptics .. .. Tuesday, 4th May, at 10 a.m.
5. Pathological exhibitions .. Wednesday, 5th May, at 5-30 p.m.

The Dean informs us that they will be pleased to welcome any of their friends, and it would make arrangements easier if they would be so good as to send him notice of their intention to attend the course.

### THE XIII ALL-INDIA MEDICAL CONFERENCE, 1936, KARACHI

We give below some of the more important resolutions passed at the conference:—

This conference is of opinion that there is an urgent and vital need of passing legislation in the shape of a *Pure Drug Act and Pharmacy Act* for British India, on the lines of that of United States of America, for the purpose of controlling the sale of drugs, as well as laying down the qualifications of the dispensers of drugs.

(a) This conference calls the attention of the medical profession, the government and municipalities to the urgent need of research in causes of malnutrition of the poor people of India and into the dietaries in various parts of India, and for the standardization of 'balanced diets' in different provinces, in accordance with the local dietetic customs of the people and the foods available during different seasons of the year.

(b) This conference desires to draw the attention of the government and the leaders of India to the fact that deficiency anæmias and diseases, tuberculosis, rickets, dental caries, infectious diseases, etc., spring from malnutrition. That the problem of prevention of diseases is partly a problem of the provision of sufficient and nutritious food for the people.

Whereas tuberculosis or white plague is insidiously making rapid inroads into populous cities in India and is responsible for high mortality incidence as shown by the vital statistics of the prominent municipal bodies in the country,

And whereas the disease is more or less endemic among the poorer section of the community and particularly among the children of school-going age whose parents and guardians can ill-afford to supply them with adequate amount of nourishing food like milk, fruits and eggs,

And whereas these children grow up poor in vitality with low resisting power which makes them more susceptible to tuberculous infection at this tender age,

This conference strongly urges upon various local bodies, district and local boards, educational institutions, government and private, carefully to collect the statistics of the disease in their respective jurisdictions, especially amongst children of school-going age, and inaugurate schemes of free milk supply to deserving children of poor parentage in humbler quarters of the cities, to provide them with adequate nutrition to fortify their constitution against the fell disease. The conference confidently hopes that such schemes, if earnestly pushed forward and assiduously carried out, will succeed in their object of building up healthy generation of manhood and womanhood.

This conference resolves that in view of the exhibition of obscene and indecent advertisement by means of newspapers, bills, and posters regarding medicines which are a nuisance and detrimental to the health of the public, particularly the young inexperienced girls and boys, the central and local governments and the local bodies be requested to take strong action to stop it.

Resolved that the government be requested to make the scheme for periodic health examination of school children compulsory and steps be taken for the preparation of a suitable scheme for the training of medical men for the purpose.

This conference requests the Government of India:—

(a) to amend the Indian Medical Degrees Act of 1916 in such a way as to make it unlawful for the unqualified persons to write any letters or words, with their names which may denote in a direct or indirect way the resemblance of these letters or words to be genuine or *bona fide* medical degrees, and

(b) to declare it an unlawful practice for such unqualified persons to place or write the designation of 'doctor' before their names.

This conference views with great concern the recent influx of a large number of doctors from foreign countries with which there does not exist any reciprocity and requests the government to take necessary measures to prevent such influx.

Resolved that in the opinion of this conference, registered medical practitioners should not have any connection with unaffiliated institutions for the teaching of the Western scientific system of medicine.

Resolved that this conference requests the government to initiate legislation to prevent any individual or corporate body to start or run any institution for the teaching of the Western scientific system of medicine, until such an individual or body satisfy some preliminary minimum requirements to be prescribed by the provincial medical councils.

Resolved that this conference views with alarm the rapid increase of 'open chemists' shops' owned and managed by the registered medical practitioners where consultation may be obtained free by all classes of people irrespective of their income or position in society.

Resolved further that this conference is of opinion that it should be declared unethical for registered medical practitioners to have any connection with an open shop where prescriptions other than his own or of other registered medical practitioners are served.

Resolved that this conference views with concern the growing tendency of the well-to-do and middle class public of utilizing free hospital facilities and thereby shutting out from the hospitals some of the poorer section of the public for whom such facilities are primarily intended and depriving the general practitioners of their legitimate income and experience.

Resolved that the Indian Medical Association be requested to take active and early steps to remedy the above state of affairs.

Resolved that this conference notes with regret the policy of some of the teaching institutions (official and non-official) in permitting their staff in charge of beds to hold positions in more than one teaching institution, leading to a state of affairs which is detrimental to the efficiency of the institutions.

Resolution:—

(a) Rural medical relief and sanitation being intimately connected with any scheme of village

reconstruction as fundamentally affecting the economic prosperity of a predominantly agricultural country like India, this conference is strongly of opinion that the Government of India and the provincial governments in the coming autonomous provinces should revise their public health policy in its essential aspects and give proper attention to it in their annual budgets.

(b) In provinces like Sind and the Punjab and others, where irrigation projects of immense importance and great magnitude have been launched and vast areas of land are under water for greater part of the year, this conference notes with regret that no adequate sanitary or drainage arrangements have been provided *pari passu* with the irrigation schemes. This deplorable state of affairs has resulted in unprecedented water-logging of such areas with consequent high malarial morbidity and mortality which has undermined the health of the countryside with considerable loss of man-power and economic ruination.

(c) While recording its sense of appreciation of the recognition, none too early, by the government of the paramount importance of rural reconstruction and the provision of the funds, however inadequate, in the central budget for the purpose, this conference is emphatically of opinion that such half-hearted measures will not touch even the fringe of the problem. It urges the governments, central as well as provincial, to make public health in the village reorganization the first charge on the state revenue; to set up sufficient rural dispensaries under qualified hands; to organize health and sanitation committees, child and maternity welfare centres and provide training facilities for *dais*; to undertake drainage and sanitary schemes in water-logged areas, and to push antimalarial measures with all the vigour and liberalize the quinine policy.

This conference is of opinion that the medical schools of the present day have outlived their usefulness and should either be brought in conformity with the minimum requirements laid down by the Indian Medical Council or be closed down without any further delay.

### THE INDIAN HONOURS LIST

1ST FEBRUARY, 1937

The following are the names of medical workers in the Indian Honours List of 1st February, 1937. We offer them our congratulations—

#### C.I.E.

Lieutenant-Colonel R. E. Flowerdew, I.M.S., Inspector-General of Prisons, Bengal.

G. C. Ramsay, Deputy Director of the Ross Institute of Tropical Hygiene and the London School of Hygiene and Tropical Medicine.

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H. A. Shumshuddin Sahib Bahadur, Unani Doctor, Mayavaram, Tanjore District, Madras.

#### Rai Sahib

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Subedar K. C. Kapur, I.M.D., Fort Sandeman, Baluchistan.

Captain D. Shluwulin, I.M.S., Bundi State, Rajputana.

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The president, in his address, reviewed the activities of the council and on the eve of his retirement while wishing good-bye expressed satisfaction on its achievements.

A motion of condolence with the widow of the late Colonel H. H. Thorburn who represented the North-West Frontier Province Government on the council was adopted, all standing.

Colonel K. V. Kukday was re-elected vice-president of the council.

The following members were re-elected to the executive committee of the council:—

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The council considered the draft recommendations on professional education together with the observations of the universities thereon. With a few modifications they were adopted and it was decided that they should come into operation from the commencement of the academic year 1939.

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The council considered the question of the recognition of foreign medical degrees of repute when held by Indian nationals. The council was of opinion that Indian nationals who have obtained medical qualifications of repute in foreign countries should not be

granted recognition in India unless such foreign countries recognize the medical qualifications of this country on a basis of complete reciprocity.

The council noted the decision of the executive committee that the question of the recognition of the

medical qualifications of Andhra University should be postponed.

After transacting various routine business it was decided that the next meeting of the council be held on 25th August, 1937, in Simla.

## Current Topics

### The State of Nutrition of School Children in South India

#### PART I

By W. R. AYKROYD

and

K. RAJAGOPAL

(Abstracted from the *Indian Journal of Medical Research*, Vol. XXIV, No. 2, October, 1936, p. 419)

In spite of a growing realization that the diet of a large proportion of the population of India is unsatisfactory, few surveys of the incidence of malnutrition among school children, and others, have hitherto been carried out.

In the present investigation 1,918 children between the ages of 6 and 17 in three South Indian towns, Coonoor, Mettupalayam and Calicut, were weighed and measured. These children (with a further 85, making 2,003 in all) were examined to discover the frequency of xerophthalmia, 'angular stomatitis' and phrynoderma. In addition, the A. C. H. index of nutrition was applied to 1,145 of these children belonging to the age group 6 to 12. The association between the presence of the above symptoms and subnormal height and weight, and between the former and 'selection' by the A. C. H. index, has also been studied.

#### PHRYNODERMA

Dryness of the skin has often been noted in famine victims, and earlier writers on keratomalacia mention the presence of this symptom. Frazier and Hu described a follicular keratosis of the skin occurring in association with xerophthalmia and keratomalacia. They recorded that the eruption involved chiefly 'the exterior surfaces of the extremities, the trunk, and finally the posterior aspect of the neck..... Histologically, the pathologic process was primarily a hyperkeratinization of the lining epithelium of the hair follicles resulting in the obstruction of the follicles, particularly at the upper portion, by a dense mass of lamellated cornified cells'. Nicholls described this condition in Ceylon and gave it the name 'phrynoderma' (toad-skin) which has been adopted by other writers. The histopathology of the condition appears to resemble that of the classical *pityriasis rubra pilaris*.

In our investigation the outer surfaces of the arms were examined for phrynoderma. Only the presence of marked degrees of the condition was noted, i.e., cases which gave to the finger tips the sensation of passing over a rough surface. Mere dryness of the skin, which was found to be present in a very high percentage of children examined, was not recorded. There were naturally many border-line cases which were difficult to assign to the positive or negative groups. We tried, however, to keep the same standards throughout.

Phrynoderma is unquestionably due to diet deficiency, but evidence has been obtained that vitamin-A deficiency may not be the primary factor.

#### ANGULAR STOMATITIS

In the present investigation marked degrees of angular stomatitis were recorded. In many cases the interior of the mouth was examined also, and it is our experience that when fissures are present at the angles of the mouth the anterior part of the tongue will be found to be red and glazed. For rapid examination, however, 'angular stomatitis' is convenient. Nicholls, in carrying out examinations of school children in Ceylon, recorded the incidence of 'sore-mouth' differently. To quote his words: 'The standard adopted has been patches of superficial erosion of the mucous membrane of the tongue or lower lip, or its later stages, when the tongue becomes red or glazed. These patches are red and are in marked contrast to the unaffected parts of the tongue which show the whitish *duvet* of the slight normal fur. Some children with sore-mouths have excoriation and ulceration of the angles of the mouth. But when they have this condition without signs of erosion of the mucous membrane of the tongue or lower lip they are considered negative'.

#### XEROPHTHALMIA

Wright recorded the commonness of xerophthalmia and keratomalacia in the Madras Presidency. Xerophthalmia has been observed in some 26 per cent of children in famine camps in South India by Aykroyd and Krishnan. In the present investigation we noted all degrees of dryness of the conjunctiva, but in the final records we have included only cases showing 'Bitot's spots'. The yellowish foamy patches on the conjunctiva which are known by this name are easy to observe, and a convenient sign in routine examinations by non-ophthalmologists.

Clinical signs of deficiency disease in 'poor' and 'better class' schools (Coonoor).

		Number examined	Number showing one or more clinical signs	Percentage	Number showing phrynoderma	Percentage	Number showing angular stomatitis	Percentage	Number showing Bitot's spots	Percentage
'Poor' schools	Boys ..	158	50	31.6	26	16.5	25	15.8	10	6.3
	Girls ..	62	12	19.4	8	13.0	6	9.7	0	..
'Better class' schools.	Boys ..	621	65	10.5	41	6.6	43	7.0	6	1.0
	Girls ..	212	29	13.7	21	9.9	15	7.1	1	0.8

## INCIDENCE OF CLINICAL SIGNS AT DIFFERENT ECONOMIC LEVELS

In the course of our examinations it became obvious that the children in the poorest schools in Coonoor were in a more wretched 'state of nutrition' than the children in the other schools. We have divided Coonoor schools into two groups, 'poor' and 'better class', and compared the incidence of signs of deficiency disease in each group. The 'poor' schools include two schools for the children of *dhobies* (washermen) and sweepers. 'Better class' is something of a euphemism, because many children of very poor parents attend these schools also. But at least it can be stated that poverty was less extreme in this group than in the other. The table below compares the incidence of clinical signs in the two types of schools. It was considerably higher in the 'poor' schools.

## THE A. C. H. INDEX

The A. C. H. measurements of 1,145 children were determined. Column three of the following table shows

The A. C. H. index was applied to 1,145 children between 6 and 12. Of these 25.7 per cent were 'selected'. There is an association between 'selection' by the index and the presence of symptoms of deficiency disease, but the index 'misses' a considerable number of children showing such symptoms. It is suggested that the index needs adjustments to make it suitable for routine work in India.

The main result of our inquiry is to show that malnutrition due to diet deficiency is very prevalent among school children in three South Indian towns. It may be added that dietary deficiency was evidenced not only as described but also by the general appearance, posture and bearing of a large proportion of the children examined. The same state of affairs probably exists in towns and villages throughout the Madras Presidency. While it is only to be expected that children living on a diet largely composed of rice, with practically no milk and very few vegetables, should show obvious signs of malnutrition, it is useful to have some exact data on this point. Systematic surveys of

Selection by the A. C. H. index and its association with clinical signs of deficiency disease.

		Number A. C. H. index taken	Number selected	Per cent selected	Number showing clinical signs	Number selected of those show- ing clinical signs	Per cent selected	Number not show- ing clinical signs	Number selected of those not showing clinical signs	Per cent selected
Coonoor	Boys ..	314	102	32.5	90	52	57.8	224	50	22.3
	Girls ..	105	22	21.0	23	10	43.5	82	12	14.6
Mettupalayam	Boys ..	211	72	34.0	64	51	79.7	147	21	14.3
	Girls ..	45	14	31.1	6	4	66.7	39	10	25.6
Calicut	Boys ..	396	70	17.7	48	32	66.7	348	38	10.9
	Girls ..	74	14	18.9	4	1	25.0	70	13	18.6
All children ..		1,145	294	25.7	235	150	63.8	910	144	15.8

the percentage 'selected' of boys and girls in the various towns. In the sixth column of figures the percentage of cases showing clinical signs in the group who are 'selected' by the index is given, and in the ninth the percentage 'selected' of cases *not* showing clinical signs.

Of all children examined, 25.7 per cent were 'selected'. Taking both sexes together, a slightly higher percentage was 'selected' in Mettupalayam than in Coonoor (33.6 and 29.6 per cent respectively). In Calicut, the percentage of both sexes 'selected' was much smaller (17.8).

The percentages of all cases showing clinical signs who are 'selected' by the index was 63.8; the percentage 'selected' of those *not* showing signs was 15.8. There is thus an association between 'selection' by the index and the presence of clinical signs of deficiency disease.

## SUMMARY

Average height and weight for the age group 6 to 15 (boys) was determined. The averages are compared graphically with those of other groups in Indian, Ceylonese, British and American boys. Indian children of a given height weigh very much less than British or American children of the same height.

In 14 per cent symptoms of food deficiency disease were present. 6.4 per cent showed phrynoderma, 9.2 per cent angular stomatitis, and 3.8 per cent Bitot's spots. The incidence of two former conditions in the children examined is compared with that recorded by other observers in groups elsewhere.

the state of nutrition of school children, following the lines of the present investigation, would throw great light on the problem of nutrition in India.

Stomatitis Due to Vitamin-B<sub>2</sub> Deficiency

By W. R. AYKROYD

and

B. G. KRISHNAN

(Abstracted from the *Indian Journal of Medical Research*, Vol. XXIV, No. 2, October, 1936, p. 411)

STOMATITIS with erosions of the lips and angles of the mouth occurring in ill-nourished groups has been described by a number of observers.

In a typical case white patches are visible at the angles of the mouth. The epithelium in this area has a sodden appearance, and the presence of fungus infection is suggested. White patches may extend inwards from the angles of the mouth to the mucous membrane of the cheek. Fissures are often present at the labial angles. Erosion of the mucous membrane of the tongue, particularly marked at the sides and the tip, is usually observed. Sometimes cracks are visible on the surface of the anterior part of the tongue. In severe cases much of the anterior part of the buccal cavity is red and eroded, and eating is painful. The posterior part of the cavity and the larynx appear not to be involved in the type of case usually encountered.

The general term 'sore-mouth' is often used by the laity to describe the condition.

We have found stomatitis of this type to be very common in children in South India, both in those attending day schools and those living in residential hostels. In the present paper the type of diet which leads to stomatitis is described, and evidence is produced to show that the condition is due to deficiency of one or more of the factors present in the vitamin-B<sub>2</sub> complex. During an investigation of diet in relation to 'state of nutrition' in children's boarding schools and hostels we found a boys' and a girls' hostel, within a short

cases 'sore-mouth' with erosion of the tongue was present.

The diets were composed largely of milled parboiled rice, other foods being present in small quantities. Judged by the usual standards both diets were deficient as regards almost all the food factors enumerated. The diet of the boys was the more deficient of the two, particularly as regards calcium. Diets of this type, in which rice predominates and the amount of protective foods included is small, are those usually found in association with stomatitis. Xerophthalmia and 'phrynodema' were also observed among the children,



Typical appearance of 'angular stomatitis' in a girl aged 10.\*

distance of each other and supported by the same mission, in which a high percentage of children was suffering from stomatitis. These hostels were within a few miles of Coonoor and an opportunity arose of trying different forms of dietary treatment for this condition.

#### STOMATITIS AND DIET IN THE HOSTELS

There were 32 pupils in the boys' hostel, and 35 in the girls'. All ages between 7 and 19 were represented, the majority of children being from 10 to 16. Of the boys 16 (50 per cent) and of the girls 25 (71 per cent) were found to be suffering from 'angular stomatitis'—fissures at the angles of the mouth. In the majority of these

the latter condition in a high percentage; we are not, however, concerned here with these conditions. The general state of nutrition of the children was visibly very poor.

The cost of food in the boys' and girls' hostels was about Rs. 2-3 and Rs. 2-9 per child per month, respectively. At this level of expenditure very little variation in diet is possible, and the diets described may be taken as typical of those consumed throughout the year.

\* Reproduced with the permission of the Editor, *Indian Journal of Medical Research*.

## TREATMENT OF STOMATITIS

The nine worst cases in the boys' hostel were chosen; all these showed glossitis in addition to fissures at the angles of the mouth. Five were given 0.5 oz. (14.0 g.) daily of cod-liver oil for three weeks. No improvement was observed. Simultaneously the other four cases were given 1 oz. daily of dried brewer's yeast (obtained from a local brewery). Improvement was visible in one week and within four weeks the white patches and erosion at the angles of the mouth, and the soreness of the tongue, had disappeared.

The five cases not improved by cod-liver oil were given daily 1 oz. of dried yeast autoclaved for five hours at 120°C. One other boy not previously treated was included in this group. Four cases were cured within four to five weeks. One boy left the hostel after four weeks' treatment with autoclaved yeast very much improved but still showing slight evidence of stomatitis. In the sixth case all signs of stomatitis did not disappear until after seven weeks' treatment. This boy complained of abdominal pain after taking yeast. We gained the impression that autoclaved yeast has a slightly less rapid action on 'sore-mouth' than unheated yeast.

During the period of treatment by unheated and autoclaved yeast all boys consumed the ordinary hostel diet and no changes were made in this diet. No improvement took place in cases receiving no diet supplements, so that the disappearance of stomatitis can not be attributed to a seasonal factor.

On the date that treatment was begun in the boys' hostel, the girls' diet was supplemented by 1.5 oz. (42 g.) of New Zealand dried skim milk daily. This was taken in liquid form, 8 oz. of water being added per oz. of milk powder to reconstitute liquid skim milk. Careful supervision ensured that each girl drank her ration of 12 oz. of liquid skim milk. All the girls were given milk.

Improvement in stomatitis was visible in a week, and within three to four weeks all cases were cured. The condition was possibly somewhat less severe among the girls than among the boys, although present in a larger percentage of the former. Among the girls there were no 'control' cases not receiving milk, but the rapid improvement which took place when milk was given left us in no doubt that milk was the operative factor. During the same period a number of boys with stomatitis in the neighbouring hostel, on a very similar diet without milk, showed no improvement. Subsequent laboratory investigation showed that the skim milk powder used was devoid of vitamin A.

Brief mention may be made here of the change which took place in the appearance and bearing of the children receiving skim milk and yeast. This was peculiarly striking among the girls receiving milk. It can perhaps best be described as an enhancement of *vitality*, very evident to the observer. Complexions improved and eyes brightened. A rapid increase in weight was observed. We propose to carry out further experiments on the effect of milk (whole or skim) as a supplement to the diet of South Indian children, and in particular to observe its effect on growth.

## DISCUSSION

Landor and Pallister have recently described stomatitis occurring in gaols in Malaya, which was found to be curable by yeast and marmite, fresh or autoclaved, and also by fresh liver. In its more advanced stages stomatitis was associated with spastic paraplegia and dimness of vision. We have ourselves observed an outbreak of stomatitis in a gaol in South India, precisely similar to that recorded by Landor and Pallister, in which treatment by dried yeast and fresh cooked liver proved rapidly effective. In the same gaol an outbreak occurred a few years ago, in the course of which some patients developed spastic paraplegia. In these instances stomatitis was associated with the consumption of a deficient diet, largely composed of rice.

We have not observed any evidence of involvement of the central nervous system in children suffering from stomatitis.

Nothing suggesting pellagrous dermatitis was present in our cases and there were no signs of the mental changes characteristic of pellagra. Diarrhoea was absent. We have observed nothing resembling pellagra in the course of extensive field work in the Madras Presidency. At the same time the mouth condition described resembles that seen in the earlier stages of pellagra. 'In the first stage (of pellagra) we observe sodden fissured conditions at the angles of the mouth, a large indented tongue with central coating and bare glistening slides and tip, often with a shiny mucous coating these red borders and red buccal mucosa. The fungiform papillae appear as pinhead red elevations'. This is practically a description of the condition observed by us.

Possibly, therefore, we are dealing with a deficiency disease in which one of the symptoms of pellagra is present. The disease is curable by fresh unheated or autoclaved yeast, liver and skim milk. It follows that the B<sub>2</sub> group of vitamins is concerned. In our investigations vitamin-A deficiency was excluded by the fact that cod-liver oil produced no beneficial effect. There was no lack of vitamin B<sub>1</sub> in the diet of the hostels, since the staple cereal included was parboiled rice which retains vitamin B<sub>1</sub> after milling.

The observation that one of the most common food-deficiency diseases in the East is due to lack of one of the B<sub>2</sub> group of vitamins is of practical importance. One had been inclined to think that the greatest qualitative defect of the diets of the poorer classes in the East was their insufficient vitamin-A and carotene content. Cheap and convenient methods of supplying the deficient vitamin-B<sub>2</sub> factor must be the subject of further investigation. In children's hostels reconstituted skim milk or butter milk, costing about one-third the price of fresh whole milk, may be recommended as a valuable addition to the diet.

## SUMMARY

1. Stomatitis was observed in two residential hostels for school children in which the diet supplied was deficient in various food factors.

2. The condition was found to be rapidly curable by daily doses of 1.0 oz. of dried yeast, unheated or autoclaved, or of 1.5 oz. of skim milk powder, cod-liver oil being without effect. It is assumed that it is due to deficiency of one or more of the factors in the vitamin-B<sub>2</sub> complex. The general condition of the children was greatly improved by the consumption of yeast and skim milk, particularly the latter.

3. The aetiology of the condition, in relation to pellagra and the various constituents of the vitamin-B<sub>2</sub> complex, is discussed.

## Reviews

**MODERN TREATMENT OF DISEASES OF THE RESPIRATORY SYSTEM.**—By A. L. Punch, M.B., M.R.C.P., and F. A. Knott, M.D., M.R.C.P., D.P.H. 1936. J. and A. Churchill Limited, London. Pp. viii plus 295, with 96 plates and 31 text-figures. Price, 15s.

THIS is a book that will 'grow' on the reader whether he be a reviewer or just a seeker after up-to-date information. By this it is not meant that the first chapters are disappointing—on the contrary they are amongst the best, but as one goes through its pages, one realizes more and more that this book does supply



something that other textbooks have failed to supply. Emphasis is laid on treatment but of course diagnosis is not entirely ignored and the result is a very nicely-balanced presentation of the subject.

The book is a highly practical one, a fact which is very well brought out in the first few pages on the prevention and treatment of the common cold. The chapter on that extremely difficult subject asthma is also one that will appeal to the practitioner. A criticism that might be made is that the reader is not given much help for distinguishing the allergic type from the non-allergic, or perhaps one should say the 'less allergic'. A very timely warning is given against being misled, in the search for septic foci, by conditions which are themselves secondary to the allergic manifestations and which disappear completely if the patient can be relieved, even by palliative means, for a week or so.

A very useful feature is the excellent description given to technique of treatment procedures, such as the production of artificial pneumothorax, and important diagnostic methods, such as the typing of pneumococci; the immediate direct method is naturally the only one described.

There are many prescriptions given throughout the book and we are pleased to see that the authors have given the pharmacopoeial names in full; abbreviations that are quite justifiable in the written prescriptions are disfiguring to the printed page. The authors have provided a very good selection of skiagrams and the publishers have reproduced these both well and lavishly.

The student, practitioner, and specialist alike will find the book a very valuable addition to his library.

L. E. N.

**TEXTBOOK OF MEDICINE.**—By Various Authors. Edited by J. J. Conybeare, M.C., M.D. (Oxon.), F.R.C.P. Third Edition. 1936. E. and S. Livingstone, Edinburgh. Pp. xix plus 1027. Illustrated. Obtainable from Messrs. Butterworth and Company (India), Limited (Publishers), Calcutta. Price, Rs. 14

THE object of this book is stated by the editor to be to provide '..... The essentials of medicine within as small a compass and as low a price as possible.....'. It is felt that the word essentials would be a better word in the title than 'textbook', for such an abbreviated and condensed publication is hardly worthy of the latter term.

The reviewer has studied the book particularly with reference to its possible use to students and practitioners in India and as a result has several criticisms to offer. In the section headed 'Skin granulomata' leishmaniasis, leprosy, yaws and mycetoma are mentioned but that very important condition granuloma inguinale is not included, and mycetoma is hardly a true granuloma.

The only treatment given for tapeworm is the old two days' starvation followed by a dose of filix mas and it is said if the head is not found treatment must be repeated. It has been known for a long time that many cases are cured without the head being found so it is better to wait for recurrence of passage of segments before subjecting the patient to a tedious and objectionable treatment a second time.

For ascariis, santonin is the only drug mentioned and 'with adults, doses up to 2 gr. may be taken safely'. This sentence would be considerably improved if the words 'and with probably little effect on the worms' were added to it.

Hookworm may be treated with thymol, oil of chenopodium and carbon tetrachloride. The much safer tetrachlorethylene is not mentioned, and the concluding sentence of this section is really dangerous for it says 'often prolonged treatment with all three drugs is

necessary before the disease is completely eliminated'. Not a word of caution is added about the necessary interval that must elapse between doses of these highly toxic drugs to avoid serious accidents, particularly in the case of carbon tetrachloride.

Many other instances can be found in the special sections of similar inadequate or misleading statements, but it is considered enough has been said to show the shortcomings of the book from the tropical practitioner's point of view.

One does not wish to appear hypercritical of what is a real attempt to provide a small and useful book. Many of the apparent mistakes and misinformation are no doubt caused by the necessity of rigid pruning and the utmost condensation possible, so as to keep the book within the prescribed limits.

Under the circumstances many essential points have to be omitted purely for want of space. In other words it is the reviewer's opinion that no matter how skilful the authors may be it is not possible to cover adequately all that is necessary to know about medicine in just over one thousand pages. This includes common skin diseases in under fifty pages. The number of small books purporting to be complete symposia of medicine but falling far short in their avowed object is nowadays very large, in the reviewer's opinion far too large, and at least as far as tropical practitioners are concerned, the book under review must be placed among the unwanted class, because even at the remarkably low price of 14 rupees it cannot be recommended for use in tropical practice.

**KIDNEY PAIN: ITS CAUSATION AND TREATMENT.**—By J. L. Jona, D.Sc. (Adel.), M.D. (Melb.), M.S. (Adel.), F.R.A.C.S., M.C.O.G. 1937. J. and A. Churchill, Limited, London. Pp. vii plus 84. Illustrated. Price, 7s. 6d.

THIS is a short but interesting and valuable publication.

It is an excellent example of how experimental methods may be combined with clinical observation and this is driven home to the reader by the citation of an actual case to illustrate each variety of pain causation discussed. The book is limited in scope and for that reason will probably not attract a great number of buyers among the practising part of the profession, who as a rule want more for their money. A great deal can be learnt from it, however, and it will well repay the study of general practitioners because kidney pain is a common and baffling condition and in this book much can be learnt about it; one of the most valuable teachings being how often kidney pain is caused not by disease of the kidney but by dysfunction brought about as a reflex from other diseased organs. Unfortunately the average practitioner will find difficulty in personally applying the diagnostic methods described because they need a good x-ray plant, special apparatus and considerable technical skill.

The book is copiously and well illustrated and there is a full bibliography. The printing, binding, paper, etc., are of the usual high standard one associates with the house of Churchill.

P. A. M.

**THE OPERATIONS OF SURGERY.**—By R. P. Rowlands, M.S. (Lond.), F.R.C.S. (Eng.), and Philip Turner, B.Sc., M.S. (Lond.), F.R.C.S. (Eng.). 1937. Eighth Edition. Volume II. The Abdomen. J. and A. Churchill Limited, London. Pp. ix plus 998, with 514 illustrations (four in colour). Price, 36s.

THE second volume of the eighth edition of Rowlands and Turner's *Operations of Surgery* has now been published. In the capable hands of these worthy editors this book has more than maintained its reputation. By the untimely death of R. P. Rowlands, British

surgery has indeed suffered a great loss, but, with the help of his colleague at Guy's Hospital, the whole book has been carefully revised, and a great deal has been rewritten.

As in the past, the present volume gives such detailed accounts of the operations of surgery as would be of real assistance to surgeons recently appointed to responsible positions, and to candidates for the higher examinations in surgery. The book has also succeeded in offering a fair criticism of newer methods that seem worthy of trial, especially those which stimulate thought and suggest the possibility of further researches. The new chapter on 'Some Recent Developments', at the end of the present volume, will be found both useful and interesting.

The chapters on abdominal surgery are adequate and up to date. Mr. W. H. Ogilvie has been in charge of several chapters, including those on the surgery of the spleen, pancreas, and the rectum. Gastric lavage and Ryle's tube have been mentioned in connection with persistent post-operative vomiting and acute dilatation of the stomach, but there is no mention of Wagensteen's suction apparatus. During recent years, the treatment of appendicitis has been fairly crystallized. The statement that 'when the cause of peritonitis is uncertain it is wise to use a right paramedian incision, otherwise the McBurney incision is the best', may be disputed. The first part of the statement might be generally acceptable, but, with regard to the latter, surgical opinion is bound to be divergent. In general, the former incision may be regarded as the incision of choice, in case of appendicitis, and in particular in the female subject.

Several chapters on urological surgery have been written by Mr. A. Ralph Thompson. Harris's suprapubic prostatectomy has been fully described. Suprapubic cystotomy has been recommended in the great majority of cases of ruptured urethra. In case of carcinoma, extirpation of the lymphatic glands has been recommended along with the amputation of the penis. There is no mention of Morson's views.

Gynaecological surgery has been dealt with by Dr. G. F. Gibberd. Wertheim's operation has been described in detail, but the modern revolt against such a mutilating and severe operation has not been emphasized. Vaginal hysterectomy has been rightly omitted. The section on thoracic surgery has been written by Mr. R. C. Brock.

These few criticisms are not meant to minimise or detract from the excellence of a standard compendium like the present volume. These will rather help to prove that this book is still indispensable to the practising surgeon and the post-graduate student. The printing, illustrations, and get-up are first rate. An adequate index is also appended.

P. N. R.

**A TEXTBOOK OF PHYSIOLOGY.**—By William H. Howell, Ph.D., M.D., Sc.D., LL.D. Thirteenth Edition. 1937. W. B. Saunders Company, Limited, Philadelphia and London. Pp. 1150, with 305 illustrations. Price, 30s.

THE reviewer feels it would be an impertinence on his part to recommend a book that has reached its thirteenth edition at the hands of its original author, who is one of the most renowned physiologists in the United States.

On account of the rapid advances in physiological science textbooks on the subject have to be revised at fairly short intervals to keep them abreast of the changes. In this revision it is important that the author should have a ripe experience so that he will know what to include of the new work, and what to ignore as likely to be of only temporary value, also certain theories that have held the floor perhaps for years but have outlived their usefulness must be discarded or

modified on account of recent work disproving them. This publication is fortunate in its author in this respect and the present edition maintains the high standard of its predecessors.

Although it is a heavy book it is well bound with a flexible back so that it need not be kept on a table when being read, because no matter how far it is opened there is no danger of the binding giving way.

P. A. M.

**DISEASES OF THE VENOUS SYSTEM: THEIR ÆTIOLOGY AND TREATMENT BY INJECTION. SPA METHODS, THEIR INDICATIONS.**—By P. K. Murphy, M.A., M.D., B.Ch., B.A.O. (T.C. Dub.). 1937. Henry Kimpton, London. Pp. vii plus 103. Price, 5s.

THIS small book is devoted to varicose veins and hæmorrhoids and their treatment, principally by injection.

It is a carelessly constructed book and the author has the habit of saying the same thing over and over again. If it had been carefully edited and the repetitions and redundancies deleted the subject-matter of real value would only occupy the space of an average-length paper in a medical journal.

On p. 26, line 2, there is an unfortunate error where 'If an obstruction is present.....' should obviously read 'If no obstruction is present.....' to make any sense of the paragraph. The want of care is also well exemplified where biniodide of mercury appears in the space of a few lines as Bi-iodure of Mercury, Bi-iodure de H, and biniodide of Hg. The first two renderings are apparently used because the prescription in which it is given is taken from the French.

In discussing spa treatment the author places Bagnoles-de-l'Orne in Normandy first and mentions two or three other French spas, and he ends the paragraph with a sentence 'A modified form of the "Bagnoles" treatment is, I believe, now being employed at British spas'. If he had followed up his belief and so given definite information as to which British spas could be recommended this section would have been of more use to the average British practitioner.

It is true the author does not claim it to be a book for teaching but rather as an expression of his views and experience together with a summary of current opinion. It would have had a better prospect of achieving its object if the facts had been marshalled in a more orderly manner.

**HISTORICAL NOTES ON PSYCHIATRY. (EARLY TIMES—END OF SIXTEENTH CENTURY).**—By J. R. Whitwell, M.B. 1936. H. K. Lewis and Company, Limited, London. Pp. xii plus 252. Price, 10s. 6d.

DR. WHITWELL'S book will be read by all interested in the history of the evolution of psychiatry with much interest, albeit the story does little credit to the intelligence of doctors in by-gone times, who clung so tenaciously to the view that mental disorder was either due to a visitation of God or the devil, or to some disturbance of bodily 'humours'. Only one voice of protest against these ignoble views is recorded, namely, that of Vincent de Paul (1576-1660), the wise and humane Frenchman, founder of numberless charitable organizations, among which was a mental hospital at St. Lazare. He was canonised by Pope Clement XII in 1737. An interesting feature of the book is a collection of chronological data of significance to the history of psychiatry. From this it appears that the first historical record of definite institutions for the mentally afflicted is to be found in the writings of Kuan Tzu who lived in the twelfth century B.C. No further record exists until A.D. 300 when a morotrophium (mental hospital) was built at Byzantium. In A.D. 491

a mental hospital was founded in Jerusalem. It is interesting to note that in the fifteenth century A.D. Spain led the world in providing accommodation for the insane. Indian readers will appreciate the number of references to eminent Indian medical sages, such as Charaka, Susruta and Vagbhata (we presume Dr. Whitwell means Banbhata). It would appear that the introduction of mental hospitals in India was the work of the East India Company, the first of which was founded early in the eighteenth century by Assistant Surgeon Conolly, a name later to become famous in the same department of therapeutics in the person of Dr. John Conolly (1794-1866), the humane superintendent of the lunatic asylum at Hanwell, who adopted the principles of Pinel. What records exist of the Madras mental hospital show that its founder was immensely ahead of his time in the ideas he entertained on the subject of psychotherapy.

**DIAGNOSIS OF SOME DELUSIONAL INSANITY TYPES IN GENERAL PRACTICE: SCHIZOPHRENIA—DEMENTIA PRÆCOX—PARANOIDAL GROUPS: A SUMMARY OF IMPORTANT DIAGNOSTIC POINTS.**—By E. Hopewell-Ash, M.D. (Lond.). 1936. Published by John Bale, Sons and Danielsson, Limited, London. Pp. 64. Price, 2s. 6d.

DR. HOPEWELL-ASH is a well-known author of a series of small yet valuable treatises on mental disorders, particularly in regard to their early symptoms. The latest of this series is extremely well written and should be of the greatest service for the type of medical man for whom it is intended, i.e., the general practitioner. It is rather lamentable that what Dr. Hopewell-Ash has to say about the inadequacy of instruction to medical students in psychiatry is as true to-day as it was thirty years ago. The diagnostic points dwelt on by Dr. Hopewell-Ash are illustrated by a selection of admirable case histories.

O. B-H.

**A TEXTBOOK OF MEDICAL JURISPRUDENCE AND TOXICOLOGY.**—By Ral Bahadur J. P. Modi, L.R.C.P. & S. (Edn.), L.R.F.P.S. (Glasgow). Fifth Edition. 1936. Butterworth and Company (India), Limited, Calcutta. Pp. 823 plus cx with 1 coloured plate and 139 illustrations in the text. Price, Rs. 15

THE present edition of this book has, obviously, gone beyond the optimum in utility. An attempt has been made by a single author at a comprehensive treatise. Under all the old items additional facts and details have been amassed while recent advances have hardly been touched upon.

There is little or nothing said about the General Medical Council of India, the Provincial Medical Councils of India, and the employer's responsibility to the employee.

The section of bloodstains and blood groups is not only defective but also misleading. The serological test for determining the source of blood, as usually performed, is a ring test and not a turbidity test. Bernstein's theory of inheritance of blood groups deals with offspring of group A and group B, and also with offspring of group O and group AB. The combinations, group AB parent with group O child, and the group O parent with group AB child are not possible.

The myth of ptomaine is still with us. On the subject of toxicology a general remark on most books on the subject may be made here: *Cannabis Sativa* and *Strychnos Nux Vomica* are unusually well illustrated but no useful information is given on poisonous mushrooms. Nearly every medical student knows all about the former before commencing toxicology but

very few medical men know anything at all about the latter even after qualifying.

The treatment of snake-bite by Calmette's serum is out of date. A combined serum against cobra and viper has been manufactured at Kasauli for over 20 years. In 1934 this serum was refined and concentrated.

The list of books recommended at the end leaves out many recent publications.

Even if all the points raised above were attended to, there would still be left a want, felt by the practitioner and the student alike, which was so suitably supplied by the earlier editions of Dr. Modi's book.

When all is said and done, however, one would not like to be without a copy of the latest edition of a book by a pioneer in the field of forensic medicine in India. His personal experiences and observations, and his collection of cases no medical man with forensic responsibilities could afford to leave unread.

The paper, the printing and the binding are good. No printer's errors arrest attention.

**ELEMENTARY PATHOLOGY: AN INTRODUCTION TO THE PROCESS OF DISEASE.**—By Keith S. Thomson, M.R.C.S. 1936. H. K. Lewis and Company, Limited, London. Pp. vii plus 74, with 32 illustrations of which 3 are in colour. Price, 10s. 6d.

THIS is a somewhat curious little book which was intended to be a concise note-book for medical, dental and other students to give them a brief idea of the subject before they attend their lectures and practical classes. It is no doubt a novel and ingenious idea on which the author may be congratulated. Blank pages have been put in so that students may draw diagrams from what they actually see in the practical class. A short description of the various pathological processes has been appended.

The title of the book is most unfortunate and very misleading. To be more precise, it is nothing more than an improvised practical note-book. Although the author does not desire it, the book really tends to be an unusually short synopsis of elementary pathology. The illustrations, though well executed, are neither convincing nor appropriate, and, excepting a few, they have obviously been drawn from bad material. Mistakes have crept in even in the description of some of the figures. For instance, in fig. 23, 'colony of actinomycosis' is a bad expression. On the whole, the book cannot be commended to students of pathology in its present form. Considering its position as a practical note-book, the cost is too high. Perhaps the omission of the coloured plate of hypernephroma of the kidney and the substitution of a similar plate of organizing pericarditis and replacing the latter by a half-tone block of granulation tissue might help to reduce the cost of production very materially.

The book is however very attractive and for this, it owes its indebtedness to the excellent work by the publishers.

M. N. D.

**WHAT IS WRONG WITH BRITISH DIET? BEING AN EXPOSITION OF THE FACTORS RESPONSIBLE FOR THE UNDERSIZED JAWS AND APPALLING PREVALENCE OF DENTAL DISEASE AMONG BRITISH PEOPLES.**—By H. Campbell, M.D. 1936. William Heinemann (Medical Books) Limited, London. Pp. xlv plus 253. Illustrated. Price, 10s. 6d.

THE somewhat oratorical title along with the cover with which this book is endowed might tend somewhat to discourage a conscientious seeker after an ideal diet, but a perusal of its pages, which can be lightly read, justifies nevertheless serious attention. A certain

number of pages is devoted to the functions and nature of a complete diet from its nutritional point of view, namely, proteins, fats, vitamins, etc. A diet, however adequately equipped in its chemical make up, may yet be lacking in certain qualities necessary—to use a narrower term—for proper aliméntation.

The author rightly stresses the importance of the physical texture of a diet. An adequate amount of roughage is, as is well known, necessary for the normal functioning of the alimentary canal, but the question of the toughness or softness of a diet on the normal development of the jaws and teeth has hitherto received scant attention; lack of proper mandibular exercise is held to be largely responsible for ill-formed jaws and overcrowding of teeth which one sees so often in the streets nowadays. Further, a food with a texture such as apples has a more favourable effect on oral and dental hygiene than the more pultaceous cooked foods. The author adduces a number of interesting facts and observations about malformed jaws but we feel from observation in India that the precise rôle of texture and nutritional value of the diet along with postnatal care has yet to be evaluated.

The book is well written and along with its illustrations should encourage many who are interested in diet on account of its slimming possibilities to realize that there may be other and more important æsthetic qualities to be hoped for from the art and science of nutrition.

**MIND, MEDICINE AND METAPHYSICS: THE PHILOSOPHY OF A PHYSICIAN.**—By William Brown, D.M. (Oxon.), D.Sc. (Lond.), F.R.C.P. 1936. Humphrey Milford, Oxford University Press, London. Pp. vii plus 294. Price, 7s. 6d. Obtainable from Oxford University Press, Bombay, India

THIS small book is a collection of addresses and essays by a well-known medical psychologist in which his views on various aspects of psychopathology and allied subjects are enunciated. Among other matters there is a dogmatic statement on the basis of psychology as to what the League of Nations should be and why it has failed in its objects up to the present.

It is a book that might be of interest to the practising general physician as a means of widening his knowledge in this special branch of medicine, but it is not sufficiently detailed to be of real value to one wishing to take up the subject of psychoanalysis as an aid in his daily practice.

**SCALPEL AND SWORD.**—By Sir James Elliott. 1936. Angus and Robertson Limited, Australia (89, Castlereagh Street, Sydney). Pp. 215. Price, 7s. 6d. (Obtainable in London from The Australian Book Company, 37, Great Russell Street, W.C.1)

UNDER the above title the author gives his personal experiences and reminiscences from the time of his arrival in New Zealand as a small boy until recent years.

These include description of the life of a medical student in Edinburgh, experiences in practice in New Zealand, and a certain amount of war service—in the South African war on a field hospital staff, and in the Great War in charge of a hospital ship. Interspersed throughout these personal anecdotes there are sketches of life in New Zealand and descriptions of much of the wonderful scenery in these islands.

It is a book that will be mainly of local interest but it will no doubt also appeal to that fairly large section of British readers who devour books on biography, travel and descriptions of countries other than their own.

P. A. M.

**AGGRESSIVE MEDICINE.**—By John Maberly, M.R.C.S. (Eng.), L.R.C.P. (Lond.). 1935. Baillière, Tindall and Cox, London. Pp. viii plus 232. Price, 10s. 6d.

THIS book with the attractive and startling title of *Aggressive Medicine* contains an account of the therapeutic uses and value of three drugs—iodized tincture of guaiacol, tincture guaiacol-chlor-iodide and tincture mansonia ovata, prepared by the British Drug Houses Limited, London. The conclusions finally reached by the author, who has used them on a number of his cases, are (1) that the iodized tincture of guaiacol is selective as regards serous membrane and fluids and is destructive to Gram-positive organisms, (2) that the tincture guaiacol-chlor-iodide is selective as regards blood and tissues other than of the serous type and is destructive to Gram-positive cocci, and (3) that tincture mansonia has specific action on Gram-negative diplococci such as *Neisseria catarrhalis*. He has used these drugs in a large variety of infectious diseases and has found them to be valuable 'internal antiseptics'. Meningitis, poliomyelitis, neuro-syphilis, pneumonia, bronchitis, pleurisy, synovitis, peritonitis, puerperal sepsis and other acute infections have all been cured by the use of these drugs. The dose of all of them is half to 1 dram twice a day. They act best when combined and bring about complete sterilization from infection. Brief histories of the cases treated by the author and results obtained are also given.

On reading the book one is apt to get the impression that the efficacy of these drugs is almost on a par with that of quinine in malaria and of arseno-benzene compounds in syphilis. It is no doubt true that guaiacol compounds have been extensively used in the treatment of some of the infectious diseases referred to by the author, but unfortunately the beneficial results obtained have not always been as marked as in the hands of the author. It would therefore be rather presumptuous to assume that these drugs are valuable specifics for the treatment of infectious diseases in which they have been employed by the author with success. Unless more extensive trials are carried out under controlled conditions the true place of these drugs in the therapeutic armamentarium of the physician cannot be assessed. The book as it stands is certainly an interesting one and is stimulating to thought.

K. V. K.

**WOMEN EAST AND WEST—IMPRESSIONS OF A SEX EXPERT.**—By M. Hirschfeld. 1935. William Heinemann (Medical Books) Limited, London. Pp. xix plus 321. Illustrated. Price, 12s. 6d.

MAGNUS HIRSCHFELD is certainly one of the great sexologists in the world and may be ranked along with recognized experts such as Havelock Ellis, Freud and others. When he writes a book on the very fascinating subject of women it is sure to attract universal attention and is sure to be read widely. But his book 'Women East and West' is a little disappointing because the title of it is a misnomer. There is very little in it about the women of the West and there is not very much about the women of the East. It is chiefly a record of important happenings and of impressions gained by the author during his tour of Japan, the Philippines, China, Dutch East Indies, India, Egypt and Palestine.

He tells us of the people he met, the lectures he delivered and the scenes he saw; here and there, as though to spice the narrative he makes a few observations regarding the women of these countries from the point of view of the sexologist and makes passing references to subjects such as marriage customs, sex life, prostitution and so on. Although there is nothing in the book that can be said to be of particular interest to the medical profession yet the lucid way in which he narrates the many events that took place and the

interpretations he gives to the many interesting observations that he made, makes the book very fascinating. It is therefore recommended as an excellent book for light reading during leisure hours, not particularly to the medical profession, but to the general public at large.

K. V. K.

#### OTHER BOOK RECEIVED

Mind and Vision: A Handbook for the Cure of Imperfect Sight without Glasses. By R. S. Agrawal, L.S.M.F. 1935. Published by the Author. Dr. Agrawal's Eye Institute, Delhi. Pp. viii plus 182. Illustrated. Price, Rs. 4.

## Abstracts from Reports

### REPORT ON THE ADMINISTRATION OF THE EXCISE DEPARTMENT IN THE PROVINCE OF BIHAR AND ORISSA FOR THE YEAR 1935-36

*Ganja*.—Nine licenses were issued for the cultivation of *ganja* during the year 1935-36, the same number as in the previous year. The total area under *ganja* cultivation during the year was 133 acres which produced 696 maunds of flat *ganja* and 206 maunds of the round variety and is expected to be sufficient to meet the demand of the provinces of Bihar and Orissa during the year 1936-37.

The total quantity of *ganja* issued on payment of duty was 36,117 seers against 35,757 seers in 1934-35. Consumption increased in nine districts and decreased in 12 but the fluctuation was not large in any district except in Purnea and Patna. The increase of 309 seers in Purnea was due to the slight improvement in the jute trade.

*The Cooch Bihar system of supply*.—*Ganja* continued to be exported to the Orissa State free of duty (other than Bonai, Gangpur, Kharsawan and Seraikella which took their supplies as usual from Sambalpur and Singhbhum on payment of duty) under what is known as the Cooch Bihar system of supply. The essential features of this system are that the State undertake to enforce complete prohibition of the cultivation of hemp plant, and also, the sale and possession within their territories of all *ganja* other than that obtained from the British warehouse, to co-operate with Government in all measures for the suppression of smuggling and illicit cultivation of *ganja* and to enforce the same rates of duty as are in force in the neighbouring British districts in return for which they are supplied with *ganja* duty free from *golas* in the British districts.

*Bhang*.—The contract for the exclusive privilege of collection, storage and wholesale supply of *bhang* in the province continued with Babu Lachman Prasad Chaudhury. During the year he collected 543 maunds of *bhang* in the district of Purnea and the whole quantity was stored in the central *gola* at Bhagalpur which had a previous balance of 84 maunds 35 seers 4 chittacks. The drug was supplied from the central *gola* to the warehouses of this province as well as to the provinces of Bengal and Assam. The quantity of *bhang* issued under bond to wholesale dealers of this province was 261 maunds 20 seers against 181 maunds and 20 seers of the preceding year, while 225 maunds were exported under bond to Bengal against 250 maunds of the previous year. Twenty-eight seers of the drug were exported to the province of Assam on payment of duty in that province against 1 maund and 13 seers of the preceding year.

The total quantity of *bhang* issued on payment of duty to retail vendors of the province during the year was 9,216 seers against 6,977 seers in the preceding year. Consumption increased in all districts except Shahabad and Darbhanga. Remarkable increases took place in the districts of Gaya (284 seers), Cuttack (552 seers), Puri (297 seers), Ranchi (125 seers), Palamau

(107 seers), Manbhum (352 seers) and Singhbhum (241 seers). Increase in these districts was chiefly due to reduction in the retail price of *bhang* and on account of vigilance of the excise officers on the smugglers of non-duty-paid *bhang*. The decrease in Shahabad and Darbhanga was nominal. The incidence of consumption per thousand of population was 3.9 chittacks against 2.9 chittacks in the preceding year.

*Opium*.—The total quantity of opium issued during the year to shops within the province was 20,826 seers against 20,086 seers in 1934-35. Consumption increased in 11 districts and decreased in 10. The increase was large in the districts of Balasore (306 seers), Puri (237 seers), Cuttack (186 seers) and Angul (36 seers) and was due to competition amongst vendors and to the slight improvement in the economic condition of the people in the Balasore district. The decrease in consumption was not marked in any district.

The practice of administering opium to children prevails to some extent in the districts of Cuttack, Balasore, Puri, Sambalpur, Hazaribagh, Ranchi and Palamau. Excise officers continued to explain the evil effects of the practice to the people found purchasing opium for children. Its evil effects were mentioned to students during lectures on hygiene by the school medical officer of Cuttack, and by the health staff of the Balasore District Board. In Puri, the officers of the District Board, the Municipality, the Education and the Public Health Departments did some propaganda work in this connection. Similar work was done in the district of Hazaribagh by the officers of the District Board and Education Department. It is reported that the practice is gradually on the decrease.

The habit of smoking prepared opium prevails to a certain extent in most of the districts but it is confined to towns and important centres of trade. There is no indication of the use of morphia as a substitute for opium as an intoxicant.

*Cocaine*.—Twenty-four persons were prosecuted during the year under report against 34 in the preceding year. The total quantity of cocaine seized weighed four ounces against three ounces in the preceding year. Cocaine traffic prevails at Bhagalpur, Patna and to some extent at Muzaffarpur. Particular care was taken to check the illicit traffic at Bhagalpur, which is most notorious in this respect, with the result that the activities of the smugglers remained under a strict vigilance and the number of the cocaine cases fell from 19 (1934-35) to 11 in the year under review.

### ANNUAL PUBLIC HEALTH REPORT OF THE PROVINCE OF ASSAM FOR THE YEAR 1935. BY LIEUT.-COLONEL T. D. MURISON, D.P.H., I.M.S., DIRECTOR OF PUBLIC HEALTH

#### THE STATE OF THE PUBLIC HEALTH AND THE HISTORY OF CHIEF DISEASES

THE state of public health in the province was not satisfactory during the year under report. Deaths under all heads of mortality, with the exception of



'Injuries', were greater than in 1934. There was a severe outbreak of cholera in the Kamrup district. The largest increase in the number of deaths was from cholera, followed by an increase under fevers.

A total of 169,723 deaths was recorded during the year, of which 7,436 were from cholera, 529 from smallpox, 106,719 from fever, 10,947 from dysentery and diarrhoea, 7,022 from respiratory diseases, 2,051 from injuries and 35,019 from 'all other causes'. The death rate for the year 1935 was higher than the decennial rate by 2.12.

**Cholera.**—The total number of deaths reported from cholera during the year was 7,436 as compared with 1,904 in the previous year. The death rate per 1,000 of population was 0.94 against 0.24 in 1934, the decennial average being 0.89.

The districts which suffered most from cholera during the year were Kamrup, Darrang and Goalpara. Deaths from cholera were reported from 108 out of 147 registration circles and from 1,509 villages out of 28,333 in the province. The largest number of deaths (2,167) occurred in May followed by April (1,249) and June (1,080). The lowest mortality (134) was recorded in October. During the year under review, 102 deaths from cholera occurred in towns and 7,334 in rural areas.

A total of 333,534 persons was inoculated with cholera vaccine in 1935, excluding those inoculated in tea estates. A total of 1,020,481 doses of bacteriophage was issued during the year under review. Bacteriophage is being tried out in the Nowgong district and in the Habiganj subdivision of the Sylhet district. In these two areas cholera vaccine was not administered. As in past years, five mobile epidemic units, each consisting of three sub-assistant surgeons and six disinfectant carriers, were employed, viz, two in the Sylhet district and one in each of the districts of Goalpara, Kamrup and Nowgong. Their services are utilized throughout the province. The units in Nowgong and Habiganj are fully employed in the bacteriophage experiment, they are not therefore available for other duties. The establishment of epidemic units has been very fully justified and the provision of more such units is much overdue.

A total of 137 deaths from cholera was reported from tea estates during the year as compared with 104 deaths in the preceding year, the corresponding ratio per mille being 0.14 and 0.11 respectively.

#### EPIDEMIOLOGY

The number of deaths from cholera during the past eleven years was as follows:—

1925	..	6,233	1931	..	5,523
1926	..	10,275	1932	..	4,971
1927	..	15,392	1933	..	5,508
1928	..	6,915	1934	..	1,904
1929	..	7,765	1935	..	7,436
1930	..	6,332			

The increase in cholera mortality in 1935 was due to an increase of the disease in the districts of Sylhet, Goalpara, Kamrup and Darrang. The outbreak was most severe in the district of Kamrup. At first the outbreak was of a sporadic nature, but later it assumed an epidemic form partly owing to delay in reporting outbreaks and partly owing to the dryness of the weather which caused shortage and contamination of drinking water. All the available resources of the public health and medical departments were concentrated in combating this epidemic in the Kamrup district. The total number of deaths was 2,851. The

epidemic of cholera in the Goalpara district which broke out in the latter part of 1934 continued till March 1935. A total of 930 persons died in the Goalpara district during the year. In the Surma Valley only sporadic cases of cholera occurred throughout the whole year. In all these districts, particularly those in the Assam Valley, cholera was imported by emigrants from the Bengal districts both by land and water. The remaining districts remained practically free from cholera and only sporadic cases occurred.

**Smallpox.**—The total number of deaths from smallpox during the year 1935 was 529 against 206 in the preceding year, showing an increase of 323 deaths. The death rate was 0.07 per mille compared with 0.03 in 1934 and 0.33 the decennial average.

**Plague.**—No case of plague was reported from any district during the year under review.

**Fevers.**—The total number of deaths from fevers during the year 1935 was 106,719 against 101,779 in the preceding year, showing an increase of 4,940 over that of the previous year. The death rate per mille was 13.46 during 1935 as compared with 12.84 in 1934 and 11.87 during the last decennium.

'Fevers' accounted for 62.88 per cent of the total provincial mortality against 64.51 in the preceding year. The figures include deaths due to malaria, kala-azar and also deaths from various diseases having fever as their predominant symptom. It is therefore not possible to determine what percentage of the total deaths under this head is due to malaria. The largest number of deaths (11,823) was recorded in June and the smallest (5,883) in March. As in previous years, quinine and cinchona were distributed free to indigent malaria patients throughout the province.

**Dysentery and diarrhoea.**—The total number of deaths registered under 'Dysentery and Diarrhoea' was 10,947 during 1935 against 8,195 in 1934. The death rate per mille of population was 1.38 during the year under review as compared with 1.03 in 1934. The decennial average was 1.16.

**Respiratory diseases.**—The total mortality from these diseases during the year under review was 7,022 as compared with 6,440 in 1934. The corresponding death rates for the two years were 0.89 and 0.81 respectively. The quinquennial average was 0.73. The highest mortality (703) was recorded in November and the lowest (474) in February.

**Epidemic dropsy.**—An outbreak of epidemic dropsy was reported from Patharkandi in Sylhet district. Dr. R. B. Lal, Professor of Vital Statistics and Epidemiology, Calcutta, and the late Dr. P. Gupta, Assistant Director of Public Health, Surma Valley and Hill Division, carried out investigations. Outbreaks of epidemic dropsy were also reported from Silchar, Karimganj and Sylhet towns. No definite factor could be traced as being responsible for the causation of the outbreaks.

**Yaws.**—During the year under review a total of 4,201 cases of yaws was treated against 3,089 in the preceding year. The result of treatment has been found very satisfactory. Rate of relapse is very low, but this is very common amongst those patients who do not complete a full course of treatment. A total of 1,780 cases was treated in the Goalpara district, and in Kamrup 673. The disease which was generally prevalent in the low-lying hills and in the foot hills in this district amongst Mikirs, Lalungs, Kacharis, Garos and other hill people showed a marked decrease during the year under report. Exhaustive and thorough survey is being made to bring all foci of infections under control. In the Nowgong district a total of 592 cases was treated in the public health department dispensaries as compared with 431 in the preceding year. During the year under report four new centres were opened in this district. In the Garo Hills 180 cases of yaws were treated.

**Kala-azar.**—The number of deaths from kala-azar during the year 1935 was larger by 75 than that of 1934.



The number of patients treated was less by 2,298. The decrease is shared by all districts except Goalpara. The method of diagnosis and treatment of kala-azar continued to be the same as in previous years. Treatment is by means of intravenous injections of urea-stibamine. Owing to the increase in the price of neostibosan the treatment of kala-azar with this preparation was stopped in this province during the year under review. Special attention is given to intensive and detailed surveys in all districts in order to detect fresh cases and to bring them under treatment as early as possible.

**Leprosy.**—During the year under review, 4,926 lepers came under treatment in the leper asylums and other centres of treatment under the medical and public health departments. Three hundred and seventy-seven lepers were treated as inpatients in the Leper Asylums at Sylhet, Gauhati and Kohima and in the Leper Ward at Dhubri and the Leper Colony at Tura. One thousand two hundred and forty-four outpatients received treatment in the dispensaries under the Medical Department. A total of 2,305 lepers was treated in the Public Health Department dispensaries during 1935. The number of outdoor clinics for the treatment of leprosy during the year was 61 against 52 in 1934. The number of clinics in the medical department rose from 126 in 1934 to 138 in 1935. The Mission Leper Colony at Jorhat treated 110 lepers during the year. Nine sub-assistant surgeons of the public health department were trained locally during the year under report in the technique of leprosy treatment. Sub-assistant surgeons of this department undertake leprosy surveys in conjunction with kala-azar surveys. No special leprosy survey was undertaken during the year. The treatment although slow and tedious is becoming popular.

**Malaria.**—Malaria is prevalent throughout the province and almost constantly in epidemic form. A total of 733,408 cases of malaria was treated in all hospitals and dispensaries in the plains districts, viz., 664,920 cases were treated in dispensaries under the Medical Department and 68,488 cases were treated in Public Health Department dispensaries. Separate figures of mortality from malaria are not available, deaths from 'fevers' in 1935 amounted to 106,719 against 101,779 in the preceding year. A very large percentage of deaths under 'fever' is directly attributable to malarial fevers. Quinine-reinforced cinchona febrifuge was used as a general preventive and curative agent against the disease and was sold to the public at the cost price of annas 3.9 per treatment. Sales, on the whole, have been disappointing and in order to overcome this, Government has approved of the proposal to sell this preparation to the public in a smaller treatment form at the cost price of annas 2 per treatment. As in previous years the Government of Assam gave a grant of Rs. 25,000 to the Assam Medical Research Society for purposes of research. The society's activities are at present confined mainly to researches on malaria. These activities are summarized in the following note supplied by the Research Officer:—

'Many of the malaria surveys in hand in 1934 are now complete and, according to the findings, recommendations for the necessary anti-larval activities have been made'. Several surveys were, however, continued during the year in order to confirm findings previously made or to correlate findings with the researches being undertaken. Three new surveys, in an hyperendemic area, were undertaken to complete data necessary for the investigations in hand. The treatment centre at Doom-Dooma, for the evaluation of the use of plasmoquine in the field, was continued.

An eight weeks' course in malariology was held during July and August and twenty candidates passed the examination held at the end of the course. Entomological investigations included the identification of 152,075 anopheline larvae, of 22,997 adult specimens and 9,348 adult anophelines dissected. Two species were found infected; 3,119 *A. minimus* and 1,046

*A. culicifacies* having sporozoite rates of 2.05 per cent and 0.38 per cent respectively, and the oöcyst rate of *A. minimus* was 3.21 per cent. *A. culicifacies* specimens found infected were from Lumding only. This species has not been previously reported as a carrier in Assam. Examinations of 16,972 blood slides, principally from hyperendemic areas, were made and in 6,899, or 40.66 per cent of these, malaria parasites were found. Data of 69,563 blood examinations have been completed from healthy, moderately endemic and hyperendemic areas in Assam. These data are being studied and a report is in course of preparation. Breeding experiments undertaken in the northernmost and coldest part of Assam have shown that under the coldest conditions present in the winter months, the adult of *A. minimus*, the principal vector of malaria, continues to emerge. With minimum temperatures averaging 54°F., the period required from the egg stage, through the larval and pupal stage to adult emergence averages 30 days. With increasing temperatures in April and May this developmental cycle from the egg to the adult emergence was reduced to 16 to 17 days and 12 to 13 days respectively. Other breeding experiments have shown that at least three batches of eggs can be fertilized by the spermatozoa retained in the spermatheca of *A. minimus* after primary matings, and that eggs of *A. minimus* are fertilized by the spermatozoa in the common oviduct during the act of oviposition.

Researches on malaria in Assam with special reference to cold weather and pre-monsoon anti-larval control have shown that the suitability of breeding conditions of *A. minimus*, the significant vector of malaria in Assam, falls into three separate groups which have been defined. The study of the malaria problem in two of these group areas shows that breeding of *A. minimus*, during the period January to mid-June, is the responsible factor for the increase in the malaria case incidence in moderately endemic areas and that, in the hyperendemic areas, breeding during this period is conducive to the rapid geometric progression in numbers of adults so that when rains breeding places are made available, breeding is transferred to these rains breeding places and continues until late November. The application of antilarval activities in the moderately endemic areas during the period early January to mid-June (i.e., until nature, by flushing, assumes control of stream breeding places of *A. minimus*) may be more economical than the present advocated period of antilarval control (15th March to 15th November) as, during the former period, much smaller water areas would have to be controlled, with the habitat of the vector concentrated. Breeding would be stopped at its lowest point in the cold weather, and pre-monsoon months, preventing not only the subsequent geometric increase in the numbers of the vector when meteorological conditions become more favourable, but, in the absence of mature adults in April, May and June, would prevent the rise in malaria case incidence resulting from active transmission during this period. Malaria control, instituted on these lines and under expert supervision in three experimental centres (two moderately endemic and one hyperendemic), has shown, during one year, a parasite index reduction of approximately 50 per cent and spleen index reduction of approximately 25 per cent. Malaria control measures in these experimental control centres are being continued. Two other towns and also two groups of villages which have been surveyed are, during 1936-37, to be included in the experimental group. The bulk of the malariogenic areas in Assam, particularly in the case of villages, comes under the classification of 'moderately endemic'. Often a single small stream is the responsible breeding habitat: therefore, if our researches prove that we can control malaria by the application of antilarval measures to the small perennial streams during the cold weather and pre-monsoon months, it will become economically possible to protect from malaria the bulk of the villagers in Assam. A lump provision of Rs. 24,500 was made by Government for the purpose of carrying out anti-malaria measures in the province.

# SEVENTY-FOURTH ANNUAL REPORT OF THE GOVERNMENT CINCHONA PLANTATIONS AND FACTORY IN BENGAL FOR THE YEAR 1935-36

THE market for quinine and cinchona has again remained remarkably steady throughout the year with the price showing little more than fractional variations due to differences in exchange. Demand is maintained, but except in India it falls far behind current supplies while the gulf which separates supply and potential demand is as wide as ever. The condition is chronic: it will probably not be righted until the fight against malaria is viewed throughout the world as a social service entitled to finance from Governments, from employers and generally from the enlightened section of the world's population. While education and a rising standard of living must have their effect in bringing malaria under control, nothing short of active State participation is ever likely to make much headway against the appalling suffering and loss of life that goes steadily on. In India, more than elsewhere, this truth may be said to be recognized and more than elsewhere it requires to be recognized, for we have the unenviable distinction of harbouring some of the world's worst malarial infection centres.

The difficulties that beset a wider and more efficacious Indian distribution of the drug are, however, not decreased at a time when constitutional changes are pending and when the future duty of growing and distributing quinine has still to be apportioned between the Central and Provincial Governments. It is, however, a happy sign that public opinion shows an increasing interest in this subject, for it is ultimately through the public conscience acting directly in public institutions or in the Government of the country that a solution of the quinine problem can be reached. It appears, however, from the trend of discussion in the legislature and in the press that the public are not so conversant with all aspects of the quinine problem as to make its interest practically effective. Its usual demand up till now has been for more and more and cheaper and cheaper quinine. It knows the remedy and it sees the ravages from malaria that go on. But there are practical difficulties in the way of all attempts to bring quinine at low rates to the great mass of India's sufferers. The general public cannot be expected to be aware of these and it may not be out of place here to refer to one, and what is probably the greatest, difficulty. The present high level of prices in cinchona products is essentially due to the difficulties of production. If the raw material were easy of production the manufacture of sufficient supplies of quinine would be easy enough, but cinchona as a plant is exacting in its demand and it is not everywhere or under any set of conditions that it can be successfully exploited. Costs of production are high, competition is restricted by reason of the climatic and soil requirements of cinchona and these combined explain high world prices.

The misfortune of these conditions was clearly recognized by the Health Committee of the League of Nations when they came to examine the question of the cheapening of quinine for the poorer malaria patient. The public demand for the lowering of quinine prices in India is obviously based on the fact that production costs here are lower than the level of world prices and Government are therefore urged repeatedly not to make a profit. The difficulty, however, is that the volume of production in India is quite insufficient to meet more than a fraction of the home demand giving the importer of quinine a virtual monopoly, and as long as this state continues so long will it be impossible for Government to reduce prices below market levels without the risk of supplies going astray into the hands of profiteers. And even if Government did take the risk their own supplies would serve but a small section of the population leaving the great bulk of national demand to be supplied by imported quinine at world prices. So far as the whole country is concerned, relief can only come from such an extension of local production as would effectively compete with

foreign quinine in meeting the total demand, and thus maintain prices at a level commensurate with the cost of production at home. It is fortunate that in India areas exist fairly suitable to the cinchona plant, and experience has shown that it can be cultivated here at costs which would allow of a cheapening of quinine for the masses.

When the public recognize this fact and finance is forthcoming there is no reason why a forward cinchona policy should not be adopted with every prospect of success. Experimental cultivation could be started under suitable conditions in different parts of the country, and all the accumulated experience of the existing cinchona organizations in India would be available to draw upon. But the success of such effort, if it is to be truly national, would seem to depend on a co-ordination of all the provincial efforts. Only certain provinces in India are fortunate in having suitable areas, and with the inauguration of provincial autonomy under the new constitution it would seem that the Central Government alone could bear the responsibility of such a national policy, so that the less fortunate provinces also may benefit. For under the present economic conditions it is not likely nor is it reasonable to ask that those provinces which can produce would make revenue sacrifices in the interest of others. This was probably one of the reasons why the Royal Commission on Agriculture stressed the importance of cinchona as a national programme. Since the Commission sat one difficulty has arisen. It lies in the fact that public health tends to be decentralized while cinchona seems to be linked with public health. But the production of quinine, as apart from its distribution, would scarcely seem to come within the scope of public health, and the public interest in prices seems to indicate that a co-ordinated and combined effort at production would be welcomed. What might be achieved by the pooling of resources is exemplified by the results in Bengal as shown in the present year's report.

*Mungpoo.*—The year's work has been progressive and returns show an increase in acreage of 81.29 acres and nearly rupees one lakh increase in block value. Weather conditions at the time of planting extensions were ideal and the plants put out have made good growth and refilling charges will not be very high next year. Some 19,000 plants of ipecacuanha were put out under covered lines during the year and the total standing crop is now 136,400 plants: a harvest of 350 lb. dry root for the year is recorded.

*Munsong.*—After filling in all vacancies in the previous year's plantings a total of 147.7 acres was put out in cinchona.

Experience has now been gained to give an opinion on present planting methods. Everything points to the fact that the longer the land is fallowed after a previous cinchona crop the better the results. The putting of old blocks for two years under green manures gives much better results than land filled in without the green crops, but, on the other hand, land which has been properly afforested with forest trees, or land which has not carried a cinchona crop, such as old *khet* land, gives still better results. Two small areas planted last year on Kashyem division in such land did so well that it was not worth while to trouble to fill in vacancies this year, though it was done due to plenty of plants being available. At the moment those two small areas are equal to any of the original plantings when they were of the same age. This type of land is now unfortunately not available. So it is a question of deciding if green manuring for the short period should continue or land be put under quick growing forest for 10 to 12 years before being used again. The writer is of opinion that if new areas can be opened up elsewhere to overcome this following period on Munsong the latter should be the future policy. The trees to be used to fallow the land can be specially selected for this purpose alone, in which case the period of fallowing could probably be less than that given above. Such species as *Erythrina* and *Albizia* to give humus, and *Alnus* to open up the soil, planted as a mixture

would be very suitable. To discontinue planting and fallow the land with forest trees would also likely be an advantage against the nursery disease. On the other hand, should conditions be such that Munsong must continue to replant as at present it seems desirable, and would pay from a cultural point of view, to extend the period under green manures for at least one year. This can be done as the best types of green manures for the purpose have, after considerable experimental work, been decided on and raised in sufficient quantity to supply the necessary seeds. The prevalence of disease on Munsong led to a policy of retaining in growth every tree that did not show definite signs of going off, but the decision to coppice such trees a second time will have to be reversed. They are usually so scattered as to make interplanting difficult while growth on the second coppice, if this does not kill the plant outright, is far behind growth after a first coppice. Experience shows that the double shock to the plant is beyond its powers of resistance. Root bark too is lost after the second operation. Healthy cinchona will stand it once but not twice, and we shall have to modify our cropping programme accordingly. In the coming year an increased bark harvest will have to come off Munsong because of the necessary removal of doubly coppiced areas that would lose in bark increment if left longer.

The nursery disease still awaits identification and, incidentally, a cure. During the year Miss Burt of the Hardinge Medical College, Delhi, and Mr. Kheshwalla of the Agricultural Research Institute, Pusa, visited Munsong in connection with it. These investigators are still working on the problem. The disease was prevalent in some nurseries more than others, Burmiak being the worst affected. Continual opening up of new nursery sites helps considerably, but lack of water and suitable sites, apart from the question of expense, places a limit on the extent to which this can be done in any one year. This and other practical methods against it continue year by year always in the hope of a remedy being found even though the mycologists are unable to give the disease a name.

The dry bark harvest was 871,795 lb., composed of Ledgeriana 797,848 lb., Officinalis 14,662 lb., Succirubra 10,601 lb. and Hybrids 48,648 lb. The bark came from dead and dying, thinnings, and coppicings from the refilled areas. In connection with the harvest 151.3 acres have been cut off including 9.9 acres which had to be written off against block 8, Burmiak on it being completely uprooted. The quantity of bark despatched from the plantation during the year was 886,493 lb., composed of Ledgeriana 812,780 lb., Officinalis 15,025 lb., Succirubra 12,437 lb. and Hybrids 45,251 lb. Of the total of 886,493 lb. despatched 200,000 lb. were sold to the Madras Government and 3,360 lb. to a Calcutta firm for experimental purposes, leaving a balance of 683,133 lb. as the quantity handed over to the factory.

Work at the factory continued during the year on lines indicated in the last annual report. There are no major developments to note but a number of quinine salts, not hitherto prepared by us, is now being supplied regularly to meet a small demand that exists and may grow in the future.

The total bark extracted was 1,361,941 lb., a reduction of 8 per cent on the previous year. Of this bark Munsong provided 61 per cent and Mungpoo 34 per cent, while the balance of 5 per cent came from the Government of India stocks of Burma and Java bark. Munsong bark contained an average of 4.37 per cent quinine sulphate, Mungpoo bark 3.75 per cent and India bark 4.1 per cent. The products obtained were as follows:—

Source of bark	Quinine sulphate	Cinchona febrifuge
Munsong .. .. .	32,700	14,433
Mungpoo .. .. .	15,691	7,584
Burma .. .. .	1,580	494
Java .. .. .	1,055	874
<b>TOTAL</b> .. .. .	<b>51,026</b>	<b>23,385</b>

Besides the quinine sulphate obtained as such and shown above a further 3,157 lb. of it was contained in the cinchona febrifuge manufactured, bringing the total of quinine sulphate recovered from bark to 54,183 lb.

Of the Bengal quinine sulphate 29,144 lb. were purified to meet current needs, the balance being left in the crude state and stored in bins. Tablets were made from 12,791 lb., which shows an increase of 23 per cent on the previous year's figure. Other quinine salts manufactured made a total of 972 lb., nearly three times the quantity made in the previous year. This has meant a considerable strain on existing resources as the factory is not properly equipped for this type of work.

Opportunity was taken this year to make a more thorough overhaul of plant and machinery than usual. Laboratory work continued at high pressure. Apart from experimental work on current problems in connection with the process, the number of analyses made during the year of bark samples and intermediates was well over twelve hundred.

## Correspondence

### INFANTILE BILIARY CIRRHOSIS

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—I have just read an annotation, without seeing the original article, in the *Journal of Tropical Medicine and Hygiene* dated 15th December, 1936, in reference to a paper on infantile biliary cirrhosis by Dr. S. C. Lahiri in your June issue, 1936, wherein bacterial toxin is regarded as an important factor in the aetiology of this disease.

In the 'Transactions of the South Indian Branch of the British Medical Association', Vol. XVII (1923 or 1924), will be found a reference to a paper of mine in which it is suggested that the cause is a dietetic one resulting from the ingestion of curry stuffs and their irritant volatile oils by the pregnant mother. Such toxin is operative during intra-uterine life and continued at the breast. Many of these infants die during the first year of life.

In support of the above view is the experimental cirrhosis induced by feeding rabbits on hospital curry stuffs, which I carried out in Madras and at home. By feeding pregnant rabbits, a biliary cirrhosis is produced in the intrauterine foetal liver. Further feeding experiments on the ingredients of curry powder were conducted without detecting the essential toxic element, although it was found that rabbits fed on green chillies for three months never 'turned a hair', while controls on curry stuffs were dead in that time, all of them from cirrhosis of the liver.

As the detail of this experimental work is not reported in the transactions and some of it was carried out subsequent to that publication it is desired in this letter to draw the attention of those interested in India where biliary cirrhosis in the infant and the portal variety in the adult are prevalent diseases and possibly due to this error in diet. I have always regarded this as one of the pressing antenatal problems of the country.

Yours, etc.,

W. LEONARD FORSYTH, M.D., D.P.H.,

MAJOR, I.M.S. (Retd.),

Professor of Bacteriology.

UNIVERSITY OF CAIRO,  
EGYPT,

18th January, 1937.

## Service Notes

### APPOINTMENTS AND TRANSFERS

The services of Lieutenant-Colonel D. H. Rai, M.C., are replaced at the disposal of the Government of the Punjab, with effect from the 15th January, 1937.

The services of Lieutenant-Colonel F. A. Barker, O.B.E., are replaced at the disposal of the Government of the Punjab, with effect from the date on which he assumes charge of his duties in the Jail Department.

The services of Major R. K. Misra are placed temporarily at the disposal of the Government of the United Provinces, with effect from the forenoon of the 30th December, 1936.

Major H. W. Mulligan, Officiating Assistant Director, Central Research Institute, Kasauli, is placed on foreign service under the Indian Research Fund Association to officiate as Director, Malaria Survey of India, with effect from the date on which he assumes charge of his duties.

In supersession of previous notification, in so far as it relates to Captain W. Scott, the services of that officer are placed permanently at the disposal of the Government of the Central Provinces, with effect from the 11th February, 1934, for confirmation in that province with effect from that date.

Captain E. A. O'Connor is temporarily employed to officiate as an Agency Surgeon, with effect from the forenoon of the 22nd October, 1936, and is posted to the North-West Frontier Province.

The services of Captain F. W. Allinson are placed temporarily at the disposal of the Government of Bengal, with effect from the afternoon of the 13th November, 1936.

The services of Captain M. S. Purvis are placed temporarily at the disposal of the Government of Burma, with effect from the forenoon of the 21st November, 1936.

The services of Captain S. T. Davies are placed temporarily at the disposal of the Government of Madras, with effect from the forenoon of the 2nd December, 1936.

Captain F. H. A. L. Davidson, on return from leave ex-India, is appointed as Civil Surgeon, Midnapore, vice Captain F. W. Allinson.

Captain E. H. Lossing, Second Resident Medical Officer, Presidency General Hospital, Calcutta, is appointed as First Resident Medical Officer of that institution, vice Dr. J. F. Colman.

Captain F. W. Allinson, Civil Surgeon, Midnapore, on relief, is appointed as Second Resident Medical Officer, Presidency General Hospital, Calcutta, vice Captain E. H. Lossing.

### LEAVE

Major-General Sir Cuthbert Allan Sprawson, Kt., C.I.E., K.H.P., Director-General, Indian Medical Service, is granted leave, on average pay, from the 14th to the 28th February, 1937, preparatory to retirement.

Colonel N. M. Wilson, O.B.E., Inspector-General of Civil Hospitals, Central Provinces, is granted combined leave from the 17th February to the 15th September, 1937 (inclusive).

Colonel C. H. Reinhold, M.C., Inspector-General of Civil Hospitals, Punjab, is granted leave on average pay for 1 month and 16 days combined with leave on half-average pay for 4 months and 5 days, with effect from the 12th March, 1937, or date of availing.

Colonel C. E. Palmer, Inspector-General of Civil Hospitals and Prisons, Assam, is granted, preparatory to retirement, combined leave for 8 months, with effect from the afternoon of the 31st March, 1937.

Lieutenant-Colonel G. Covell, Officiating Director, Malaria Survey of India, on foreign service under the Indian Research Fund Association, is granted leave for 3 months and 23 days on average pay and for 4 months and 7 days on half-average pay, with effect from the 1st March, 1937, or subsequent date from which he may

avail himself of it. His services are replaced at the disposal of the Director-General, Indian Medical Service, with effect from the date on which he proceeds on leave.

Major J. E. Gray, Civil Surgeon, Nasik, is granted leave on average pay for 6 months combined with leave on half-average pay for 4 months, with effect from the 15th April, 1937, or the subsequent date of availing.

### PROMOTIONS

#### Majors to be Lieutenant-Colonels

G. V. Ram Mohan. Dated 20th October, 1936.

H. Williamson, O.B.E. Dated 17th December, 1936.

N. M. P. Dotivala, M.C. Dated 23rd December, 1936.

#### Captain to be Major

W. Scott. Dated 3rd September, 1936.

#### Lieutenants (on probation) to be Captains (on probation)

Dated 1st November, 1936

V. D. Gordon.

B. deBurca.

D. R. Nicol.

J. Morgan.

G. R. C. Palmer. Dated 14th November, 1936, with seniority from 1st May, 1936.

A. C. Taylor. Dated 10th November, 1936, with seniority from 1st May, 1936.

J. Revans. Dated 10th November, 1936, with seniority from 1st May, 1936.

T. Somerville. Dated 10th November, 1936, with seniority from 1st May, 1936.

L. M. Kelly. Dated 10th November, 1936, with seniority from 29th June, 1936.

#### To be Lieutenants (on probation)

31st October, 1936, with seniority 31st October, 1935

Michael Carson Lyndon Smith.

William Laurie.

Benjamin Morrill Wheeler.

31st October, 1936

Arthur Henry Walter Mitchell.

Charles Henry Bliss.

Brian James Doran (Seed.).

Robert Brocklesby Davis.

Francis MacDermot Byrn.

James Heaton Cater.

James Duncan Munroe (Seed.).

## Notes

### A NEW HERNIA DIRECTOR

By LEONARD LEY, M.B., B.C. (Cantab.)

I HAVE noticed always that in dividing the neck of a hernial sac there is, even with the winged hernia director, considerable difficulty in preventing the hernia sac curling round.

It occurred to me that if the director had wider wings, and particularly if a deep slot was cut on each side of the grooved director so that the wings could slide down over the neck of the sac, the intestine would be completely isolated from the field and unable to slide up and over the director.



I wrote to Messrs. Down Brothers and they have carried out my ideas most meticulously.

I and my colleagues have since had several opportunities of testing the instrument and it has fulfilled all my anticipations.

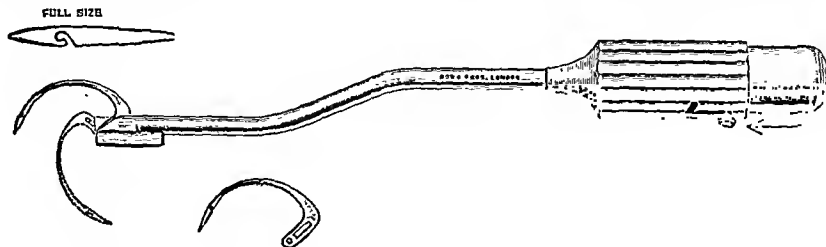
The accompanying illustration will demonstrate the modifications I have mentioned above.

I am very grateful to Messrs. Down Brothers for the care they have taken in carrying out my suggestions.

### IMPROVED NEEDLE HOLDER FOR PROSTATECTOMY

By J. COSBIE ROSS, CH.M. (Liverp.), F.R.C.S. (Eng.)

THE widespread performance and success of Harris' operation for suprapubic removal of the prostate necessitates a periodic review and possible alteration of the armamentarium. Two criticisms of the needle holder appear to be justified. In the first place the



fact that the shaft is straight causes the operator's hand to obscure the operative field and to make it difficult to place the catgut in the appointed slot, especially if the operation is complicated by an adipose abdominal wall or narrow pelvis. The second difficulty is that the actual insertion of the needle may induce bleeding. Harris states that 'in order to avoid hæmorrhage from the needle puncture, it is important that the needle should not have a terminal sharp cutting edge. The needle should be sharpened only at the actual point. It is made of rustless steel, and must be kept sharp'. I do not consider that this precaution goes far enough. The needle commonly supplied with the Harris needle holder is flattened from side to side, and although there is no cutting edge, a slit-like opening is produced which may induce hæmorrhage when the needle is inserted.

In an attempt to obviate these two difficulties I have designed a needle holder which has two main characteristics. The shaft is angled about half-way between the needle and the holder. This permits a clear view of the needle both at the moment of insertion and immediately afterwards, by keeping the operator's hand out of the line of vision. The angle involves the pilot being made with a series of joints similar to a chain so as to pass the bend. Secondly, a round-bodied needle is provided. In order to eliminate the occasional annoyance of the catgut slipping out of the slot before being drawn through the tissues, a lateral slot that renders this accident impossible is provided with the round-bodied needle.

I have now used this needle holder in many cases and have found it very satisfactory. The angled shaft permits a good view of the depth of the wound and the round-bodied needle causes no additional hæmorrhage. Finally, the needle appears to bite readily into relatively tough tissue.

The needle holder was made for me by Messrs. Down Brothers Limited, 22a, Cavendish Square, W.1, who also suggested the lateral suture holding slot.

### CALCIUM GLUCONATE AND IRON

FOR use in conditions which arise from the deficiency of calcium and iron, 'Tabloid' calcium gluconate and iron (effervescent) has been issued by Burroughs Wellcome and Co. One dissolved in a tumblerful of water makes an effervescent draught containing 20 grains of calcium gluconate and three grains of iron and ammonium citrate.

The product meets the physiological demand for calcium and iron in adults and children where a deficiency in the dietary supply is suspected, but where no actual

clinical manifestations have been observed. Another suggested use of calcium gluconate and iron is during pregnancy and lactation to reinforce the dietary calcium and iron in order to cope with the demands for these elements by the developing fœtus or infant. It can be given with advantage over a long period to ensure an adequate supply of calcium for fœtal bone formation, and to replace the abnormal loss of iron during the pregnancy.

The dosage of 'Tabloid' calcium gluconate and iron in pre-natal cases is one product twice daily for a month then after the lapse of another month the treatment is resumed. An alternative method is to give one product daily over a period of several months. Where there is a marked deficiency of lime in the water

of some districts, larger doses can be given with benefit. The dose for normal use is one or two products daily in a tumblerful of water.

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Original Articles

TUBERCULOSIS IN INFANTS AND CHILDREN

By A. C. UKIL, M.B., M.S.P.E. (Paris), F.S.M.F., F.N.I.  
(From the Tuberculosis Inquiry, I. R. F. A., All-India  
Institute of Hygiene and the Chest Department,  
Medical College Hospitals, Calcutta)

VERY little is known regarding tuberculous  
infection and disease in infancy and childhood

It is known that 15 per cent of the total deaths  
from tuberculosis in most European countries  
account for the initial peak of mortality from  
tuberculosis which has not yet been recorded in  
any munieipal or non-municipal area in India.  
From the already increasingly high incidence  
and mortality rate from tuberculosis, especially  
in the urban and industrial areas, of this country  
and from the sanitary condition and hygienic  
habits of the people, one would expect a high  
mortality from tuberculosis in the earlier years.  
It has been previously noted by us that familial  
contagion is very frequent in India, a history

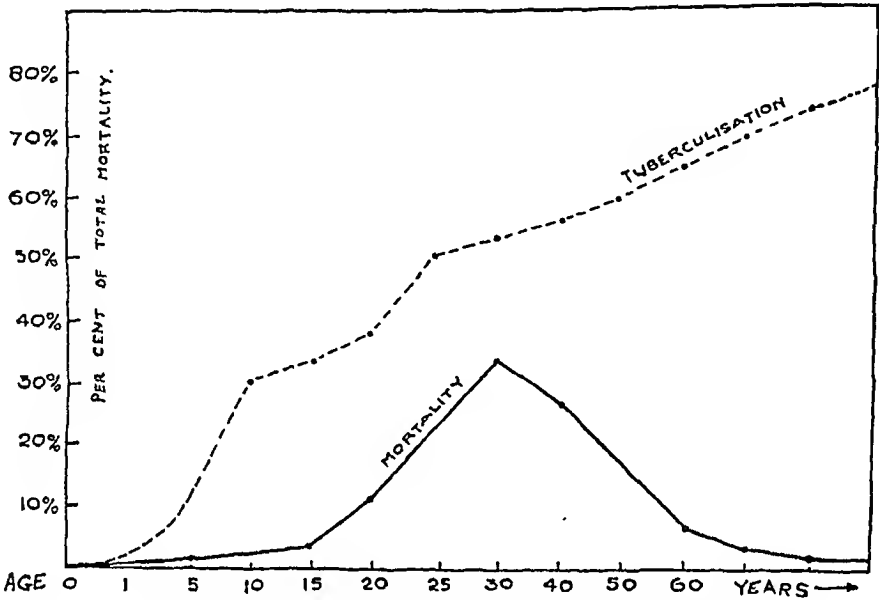


Fig. 1.—Mortality curve of tuberculosis in Calcutta.

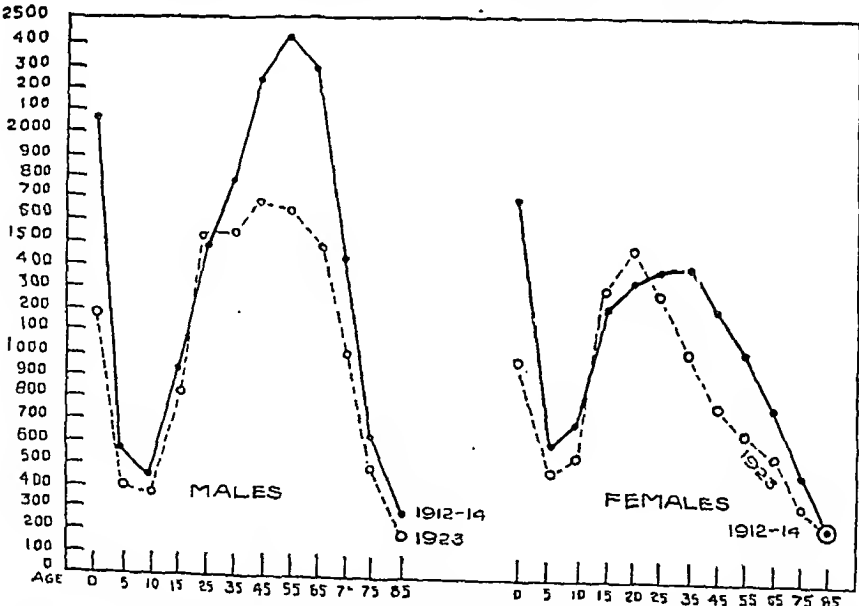


Fig. 2.—Total tuberculosis death rates at age periods in England and Wales (1912-14 and 1923).

in India. Tuberculosis is now already recog-  
nized as the most important major cause of  
morbidity and mortality in India, probably  
only next to that of malaria (Russell, 1935).

of contact having been obtained in 40.2 per cent  
of x-ray-diagnosed cases (Ukil, 1933). We do  
not yet know very well what fraction of the  
notoriously high infantile mortality in India is



really due to tuberculosis, especially in tuberculous homes.

In an investigation to find out the position, we can get an idea from tuberculin surveys among infants and children among the average population, in tuberculous and non-tuberculous homes, from autopsy evidence and from hospital cases. Let us now see what evidence we can adduce from each.

*Tuberculin survey among 1,656 apparently normal children in rural, semi-rural and urban areas*

Age	Total number of cases tested	Percentage of positive reaction
0-5 years ..	236	11.4
5-10 " ..	813	30.1
10-15 " ..	507	33.3

These rates by the von Pirquet test are undoubtedly lower than in highly industrialized and urbanized Western countries, but this probably represents the correct Indian position. The average tuberculin incidence at all ages obtained by us in an earlier investigation (Ukil, 1928) was found to be 45.9 per cent and the evidence obtained from the bodies of persons dying of accidents or murder autopsied at the Calcutta police morgue has been found to be 47.8 per cent. When we analyse the autopsy evidence among only 23 children between 0-15 years, the figures are found to be slightly higher, as will appear from the table below:—

Age	Number of cases examined	Evidence of tuberculosis, per cent	Tubercle bacilli demonstrated by culture, animal inoculation and histological examination, per cent
0-5 years	15	33.3	20.0
5-15 "	8	37.5	37.5

The incidence, however, changes quickly in presence of a source of infection in the home, those having an intimate and recent contact showing a higher incidence than those having distant and remote contact (Ukil, 1930).

In one of our recent studies (unpublished) among 342 children from 0-15 years in tuberculous homes, the average incidence of positive tuberculin reaction by the Mantoux test was found to be 75.7 per cent. Among children between 0-5 years, it was found to be 70 per cent. These figures are a little higher than what Dow and Lloyd (1930) obtained in England some years ago. The comparative position among the contact and non-contact children as well as the

sources of contagion in our series are shown graphically below:—

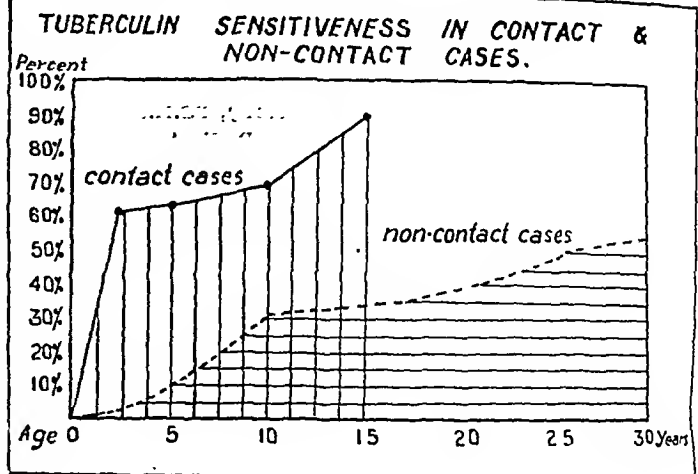


Fig. 3.

#### HISTOGRAM ILLUSTRATING THE SOURCES OF INFECTION IN "CONTACT" CHILDREN (444 Cases)

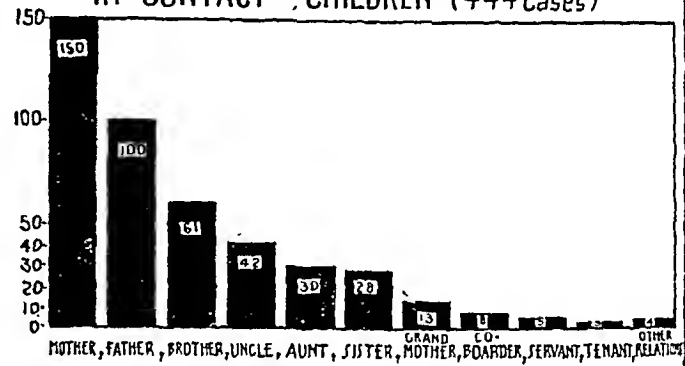


Fig. 4.

#### Evidence of tuberculous disease in hospital cases

The following table shows the number of cases confirmed by tuberculin and x-rays at the chest department, Medical College Hospitals, from 1934 to 1936:—

Age	Total number
0-2 years ..	9
2-10 " ..	104
10-15 " ..	277
<b>TOTAL</b> ..	<b>390</b>

These numbers do not include the cases detected by a survey of tuberculous homes referred to later on in this paper.

Some years ago, we obtained the following incidence of extrapulmonary tuberculosis among

1,019 cases in a series of 52,550 general patients attending the outdoor departments of this hospital:—

Age	Glandular tuberculosis, per cent	Osteo-articular tuberculosis, per cent
0-5 years ..	7.5	12.5
5-10 " ..	5.0	15.0
10-15 " ..	17.0	12.5

Nobody knows what was in the fate of these children. Although we know that tuberculous disease in infancy and childhood occurs mostly in those reared in a tuberculous environment, yet, fortunately for the human race, infection is only exceptionally followed by disease. Otherwise all the tuberculin-positive infants of this country would be ill with, or succumb to, tuberculosis before reaching adolescence. Tuberculous disease in childhood has a strong tendency to heal and, though most of the infected and diseased escape death, a certain proportion succumb to meningeal or other forms of the disease.

From the mortality figures for England and Wales in 1927 quoted below, it will appear that extrapulmonary tuberculosis, and particularly meningitis, is the chief fatal form of the disease up to five years. Towards the latter end of this period, the tuberculosis scene changes somewhat and the child develops an ability to form fibrous tissue around a tuberculous lesion.

Age	All forms of tuberculosis	Tuberculosis of the respiratory system
0-1 year ..	718	91
1-5 " ..	2,284	378
30-35 " ..	3,485	3,208

In studying the childhood type of tuberculosis in India, it should be borne in mind that the degree of tuberculization of the population in India to-day is still only half of that in European countries and that there is quite a large number of adolescents and adults in remote rural and semi-rural areas who present a 'virgin soil' and thus show, when infected, the childhood type of tuberculosis, as has been previously pointed out by us (Ukil, 1930).

Besides the above cases, we have been able to collect materials from and to study over a dozen cases of fatal tuberculosis obtained from the autopsy rooms of the Medical College Hospitals and the police morgue. Most of them had been wrongly diagnosed, due probably to the absence of a proper perspective in the mind of the average medical man in this country.

*Some facts obtained from tuberculous homes*

We had recently an occasion to examine and to follow up 444 children belonging to homes

which have or had a definite case of pulmonary tuberculosis under our care at the chest department. The 'contacts' of these cases have not only been examined periodically clinically and with the help of the Mantoux test and skiagraphy, but have been regularly followed up by tuberculosis health visitors. Two-thirds of these children belonged to the poorer classes. We do not propose to go into the whole evidence emanating from this study but shall try to state a few salient features in connection with the present paper. Of these, 343 were in contact with 'open' cases, 27 with 'closed' cases and 74 with 'known sputum' cases. Three hundred and eighty-five had 'intimate' contact, while 61 had 'distant' contact. In 385 of these cases, radiographical examination was done. Among them 15 per cent showed active parenchymal lesions, 8 per cent showed arrested parenchymal lesions and 36 per cent showed grossly enlarged tracheo-bronchial glands. In the remainder no lesions could be detected. The following table gives the radiological evidence in relation to the tuberculin reaction according to age:—

*Radiological evidence (383 cases)*

Nature of lesion	AGE GROUP (IN YEARS)				Total	Per cent of total cases	Mantoux positive per cent
	0-2	2-5	5-10	10-15			
Active parenchymal lesion.	10	17	26	10	63	16	90
Arrested parenchymal lesion.	1	3	14	9	27	7	88
Enlarged hilar glands.	22	44	45	24	135	36	70
No lesions detected.	18	33	73	36	160	41	73

It has been found that the percentage of positive reaction varies *directly* with age, while the incidence of demonstrable and active lesions varies *indirectly* with age. Active lesions were found more frequently in the younger ages (*vide* graphs, figures 5 and 6).

We have only been able to observe these children through a period of three years. From the history taken for five years, the tuberculosis mortality among children in these homes has been found to be twice as high as the general mortality. This probably is an under-estimate, as a relatively high general mortality rate among infants and children is likely to mask the difference between tuberculosis and non-tuberculosis death rates. Tuberculosis mortality among adults in these homes has been found to be three and a half times as high as general mortality.

One more point remains to be discussed. The investigations of Blacklock, Stanley Griffith and others have shown that in Great Britain about

25 per cent of childhood tuberculosis occur from bovine infection, and are due to drinking the milk of tuberculous cattle. Although we do not yet know all we want to know about the existence of bovine tuberculosis in India, it is certainly much less common here than in European countries. When we consider this along with the fact that people in this country almost invariably boil the milk they drink it makes the possibility of bovine tuberculosis playing an important rôle in the dissemination of tuberculosis among infants and children rather remote. When we consider the following data, in addition to what we gave in a previous paper (Ukil, 1933), there will be no doubt that the contagion from human sources is practically the only method of infection in this country. From the habits and mode of life of the people

*Early pulmonary lesions caused by the human type of bacillus in 26 children*

Source of material	AGE INCIDENCE	
	0-5 years	5-15 years
Cervical glands .. ..	2	10
Axillary glands .. ..	1	Nil
Tracheo-bronchial glands .. ..	3	Nil
Inguinal glands .. ..	Nil	1
Mesenteric glands (from autopsy materials) .. ..	Nil	2
Bones and joints .. ..	2	4
Skin .. ..	Nil	1
TOTAL .. ..	8	18

*Parenchymal lesions in lung (active & arrested) among positive reactors according to age*

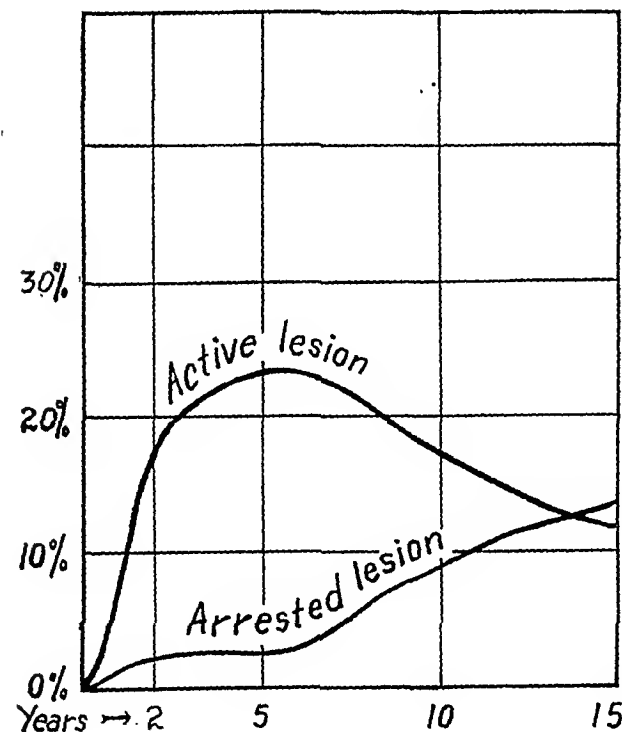


Fig. 5.

in general in this country, it is unthinkable that tuberculous disease, in its various forms, does not contribute substantially to the total mortality figures in infancy and childhood.

*The relationship of the positive Tuberculin reaction to parenchymal lung lesions according to age.*

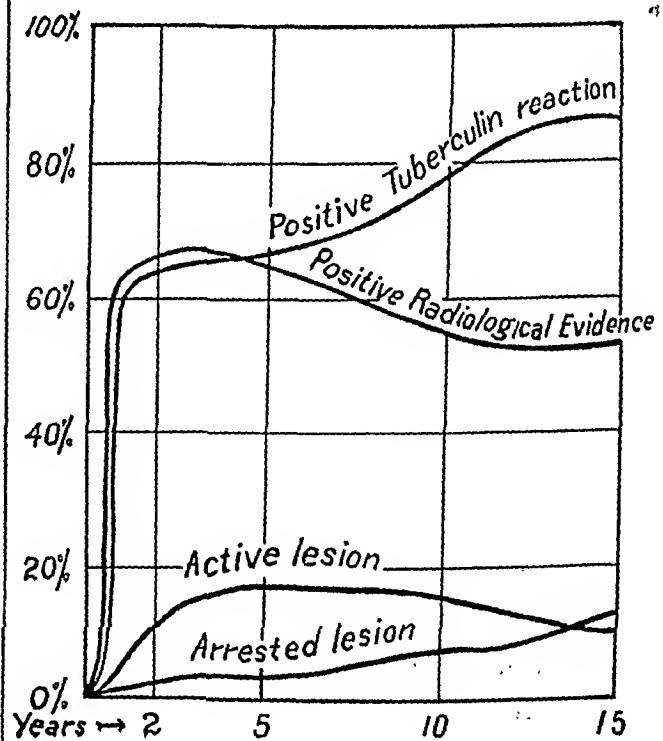


Fig. 6.

*Early recognition*

From the evidence adduced above, it will appear that the need for the early recognition of tuberculosis in infancy and childhood has

not yet attracted sufficient attention from medical practitioners or from public health workers. No doubt the infection and mortality are much higher in 'home contacts' than in non-contacts. The mortality is particularly high in the first year of life and very much lower afterwards. This is easily understood, as the infant lives strictly within the house and has therefore more chances of contact with a source of infection than an older child who spends more time out of doors. The ultimate prognosis of a case depends not only on the dose and intimacy of contact, but also on the age of the child and the continuance or stoppage of contact. Asserson (1927) observed that 15 per cent of those infected under 12 months and 2.6 per cent of those infected between one to two years of age died of tuberculous disease. Ribadeau-Dumas (1925) gives the mortality after infection in the first three months as 92 per cent, in the first year as 50 per cent and in the second year as 10 per cent.

The three- to seven-year period represents a period of temporary calm, troubled only by occasional cases of meningitis or bone tuberculosis. This temporary calm is followed by the preparation of the 'candidates' for the adult type of tuberculosis.

The difficulties of a timely diagnosis are increased by the fact that the symptoms of childhood tuberculosis are, as a rule, relatively few in the average patient. The manifestations may be entirely absent in cases with advanced and active lesions. Tuberculous disease in infancy and childhood occurs mostly in those raised in a tuberculous environment, i.e., where either a near relative or a nurse or an attendant has been or is a case of 'open' tuberculosis. Crowded living conditions, poverty and defective sanitary habits and customs increase the chances of exposure and disease in India.

The problem of the 'open' adult case in the house is, therefore, of paramount importance not only in diagnosing a case of childhood tuberculosis, but also in isolating the child from repeated large dose infection which hypersensitizes and makes him more vulnerable to the disease process. The isolation, education, and treatment of the adult case are as much important as is the early detection of infection in infancy and childhood.

Some have gone as far as to suggest that every child should not only be tested with tuberculin thrice before he reaches adolescence but also x-rayed for the detection of latent and active tuberculous infiltrations. We have said that 8 per cent of the 'contact' children examined by us showed latent and 15 per cent showed active parenchymal lesions in the lungs. We are not in a position to say what fraction of these will develop into adolescent disease, but some will surely do so if the vicious circle of infection and resistance is not broken.

As a correct interpretation of the Mantoux test and clinical findings is necessary for a correct and uniform diagnosis, we think it will not be out of place to give here a few points about them.

The main points of difference between the childhood and adult type of tuberculosis may be summarized as follows:—

<i>Childhood type</i>	<i>Adult type</i>
1. Usually occurs in children, much less frequently in adults. It is the result of a primary infection. May be localized in part of the lung.	1. Usually occurs in adults, but may be found in children. Result of a continued infection or a reinfection. Localization is usually in the upper part of the lung. The first clinical manifestation is usually sub-apical.
2. Associated tracheo-bronchial lymph nodes are always involved, but may not be demonstrable.	2. Tracheo-bronchial lymph nodes not grossly involved by the reinfection except sometimes in the terminal stage.
3. Caseous lesions usually become calcified or encapsulated in fibrous tissue. Occasionally a lesion progresses to excavation.	3. Caseous lesions usually followed by excavation or fibrosis or both.
4. Infiltrated areas commonly resolve, leaving trivial or no scars, except for the foci of caseation, which usually become calcified.	4. Infiltrated areas may recede with the production of more or less fibrous tissue.
5. The prognosis is good.	5. Prognosis in children is poor.

The first important point to note about a patient is whether there is a history of exposure. Next, we are to ask about the local and constitutional symptoms, which are less definite and less severe than in adults.

*In infants between 6 months to 2 years, the following should be looked for:—*

(1) Unexplained anorexia and loss of weight or suspension of growth.

(2) Fever. A persistent fever even after half an hour's rest in bed, when not explained by other verified causes, should lead one to suspect tuberculosis. It should be remembered that athrepsia alone may be present without any fever at all.

(3) Fever and anæmia, often with enlarged spleen and liver. In severe infections, the lung lesion, usually broncho-pneumonia, may be associated with the above, along with the enlargement of superficial glands. Such cases may have to be differentiated from malaria, kala-azar, syphilis and pseudo-leukæmia.

(4) Cough and expectoration. Cough may be altogether absent or may be caused by the pressure of enlarged glands on the bronchi. Stethoscopic signs may be entirely absent or one may hear unilateral, localized, crepitant or sub-crepitant râles or rhonchi. As very few children expectorate before the tenth year, the best way

to demonstrate the presence of tubercle bacilli is to examine for them either from a throat swab, or from centrifugalized stomach wash or fæces.

(5) Sero-fibrinous pleurisy, especially in the mammary region, is frequently present and should be looked for.

(6) Dyspnoea and stridor are observed in many cases of tracheo-bronchial adenopathy. They may be sometimes confused with diphtheria, asthma or enlarged thymus.

When one or more of the above symptoms are present, it is as well to do a Mantoux test, and, if positive, to have a careful examination under the x-ray screen, including the lordosis position, and a skiagram of the chest. A definite involvement of the lung parenchyma or hilum or both, along with a positive tuberculin test, ought to justify a diagnosis of infantile tuberculosis, until otherwise proved. In the case of enlarged superficial glands, syphilis and Hodgkin's disease should be excluded.

In children between 2 to 10 years, the diagnosis should be clinched on a common-sense consideration of a multiplicity of minor symptoms and signs, local and constitutional. The history of exposure having been taken first, a weakly pale child with capricious appetite and failure to thrive, with perhaps some temperature or cough, ought to be looked on with great suspicion. A careful physical examination may show a flat chest or visible veins or enlarged supra-clavicular glands on inspection. The percussion signs, except perhaps the tracheophony of d'Espine's sign to some extent, if properly interpreted, are not of much value. Auscultatory signs indicate nothing else but the presence or pressure of enlarged glands on trachea or bronchi. The Mantoux test should always be done, and, when positive, it should be interpreted as evidence of past infection. It indicates active disease in very young children in cities or in older children in rural and semi-rural areas only when the clinical manifestation of impairment of health is present, along with corroboration by x-ray evidence. It requires a good deal of experience and carefulness in interpreting x-ray evidence of parenchymal infiltration or tracheo-bronchial adenopathy. The interpretation of x-ray pictures should go hand in hand with the history, constitutional symptoms and signs, tuberculin test and laboratory data. In the case of older children, however, it should be remembered that stethoscopic signs may sometimes be present long before radiological evidences are brought forth.

The technique and interpretation of the intradermic tuberculin test (Mantoux) are given in an appendix at the end of this paper in the hope that they may prove useful to physicians and public health workers in investigation and diagnosis. The interpretations are based on

Indian experience of quite a large number of cases in rural, semi-rural and urban areas.

#### *Prognosis and treatment*

Barring meningeal complications or intercurrent acute infections, the prognosis in childhood tuberculosis is, generally speaking, favourable. If they are removed from the source of exposure, they respond well to good food, fresh air, sunlight and a hygienic environment. This response, of course, depends, to a great extent, on the patient's relative immunity to infection by the tubercle bacillus, the size and virulence of the dose and the duration of exposure.

The average child with tuberculosis need not be excluded from school but he should have more rest, fresh air and better diet than other children. Those with active diffuse parenchymatous lesions should be institutionalized in a climatic sanatorium until the signs of activity have completely disappeared. It should be remembered, however, that though the childhood lesion may be fibrosed or calcified, there is a danger of its breaking down into adult tuberculosis during adolescence. Every tuberculous child should, therefore, be under medical supervision until the period of adolescence is safely over. Such cases should always guard against over-exertion, both mental and physical, and should try to maintain a good standard of resistance.

#### *Conclusion*

It has been stated above that infantile and childhood tuberculosis occurs mostly in tuberculous homes. Do we really possess any idea about the sources of contagion in urban and rural areas in India to-day? Tuberculosis has been declared an infectious disease, notifiable by medical practitioners (but the rule is very seldom enforced), only in municipal areas in three or four provinces. In two more (Bombay and the Central Provinces), the heads of families in municipal areas are required to notify on penalty for non-compliance. Nowhere is it notifiable in rural areas.

The registration of deaths is so defective that the Public Health Commissioner in his report for 1932 (p. 87) made the following remarks:— 'The value of the recorded figures is greatly vitiated by the fact that correct diagnosis of the cause of death is rarely obtained and numerous deaths from tuberculosis are, without doubt, registered both in towns and villages as due to fevers and respiratory diseases. Indeed it may safely be assumed that the majority of deaths from tuberculosis is registered under one or other of these groups'. A large number of deaths reported to be due to fever, bronchitis, etc., has been found on investigation to be really due to tuberculosis. Rogers (1904) and Stewart and Proctor (1906-07) found that, in some rural areas in Bengal, 9 per cent of the deaths reported as due to fever were really

due to tuberculosis. In an inquiry in the suburbs of Calcutta (Cossipore-Chitpur) conducted in 1907-11, it was found that 20 per cent of the deaths entered as due to respiratory diseases were actually due to phthisis and that 50 per cent of phthisis cases were entered as due to fever in public health returns. Lieut.-Col. (now Sir Cuthbert) Sprawson found that, in the Lucknow municipality, 17.2 per cent of all deaths were due to tuberculosis. Dr. A. Sousa, an Assistant Director of Public Health in the United Provinces, found that 19 per cent of all deaths in Allahabad municipality were due to tuberculosis. Major-General Graham stated in 1927 that the mortality from tuberculosis in some large cities exceeded that of certain crowded European cities.

If this is so and if we know that a large number of infants below one year, who have been in contact with tuberculosis cases in the household, succumb to this disease, is it possible that the infants and children of India escape death from tuberculosis in the early age period when the bacilli are implanted on 'virgin soil'? The Public Health Commissioner's report for 1932 states that 40 per cent of infantile mortality are from respiratory diseases, that debility, malformation and premature birth account for another 40 per cent, that convulsions account for 10 per cent and that remittent and undefined fevers account for 2.5 per cent of deaths. Do we know to-day what fraction of these is really due to tuberculosis? Probably because we do not know anything about these, the Public Health returns for mortality do not refer separately to the different categories of deaths from tuberculosis in infancy and childhood (meningeal, miliary, etc.). Can we shut our eyes any more to this state of affairs?

The workers of the public health department cannot get correct returns unless, in the absence of a tuberculosis service in the country, the general practitioners come forward with a proper outlook towards the problem. A proper knowledge on this subject has so long been lacking because we neither possessed special children's hospitals nor tuberculosis dispensaries wherefrom data could be gathered. The very insufficient data which we have been able to produce with a great deal of difficulty, we hope, will convince public health, maternity and child welfare workers and practitioners in general of the importance of detection, registration and prevention of infantile and childhood mortality from tuberculosis. The establishment of tuberculosis clinics in different parts of the country is no doubt a move in the right direction, but what can we expect from only 58 clinics in the whole of India at the present moment? An alert general practitioner can, therefore, do much more to prevent this unnecessary slaughter of infants and children. If this small paper helps to bring about this alertness, we shall deem our efforts amply rewarded.

### Acknowledgment

The writer acknowledges with grateful thanks the help that he has received from the authorities of the Medical College Hospitals, Calcutta, the Professor of Pathology, Calcutta Medical College, the Police Surgeon, the Health Visitors of the Tuberculosis Association of Bengal, Dr. P. K. Sen and from his staff at the Chest Department and at the All-India Institute of Hygiene and Public Health in working upon and in mobilizing the materials used in this paper.

### APPENDIX

#### *The technique and interpretation of the intradermic tuberculin test (Mantoux)*

The Mantoux test is more accurate than the cutaneous and other tests in that a known amount of tuberculin can be given and the dose increased, if desired. For this reason, a slightly larger number of reactions can be obtained than with the cutaneous test of von Pirquet. It has been shown that the Pirquet test may be considered to be equivalent to 0.1 c.cm. of a 1/1,000 dilution (= 0.1 mg.) of Old Tuberculin (O.T.) administered intradermally, so that when 1/10,000 dilution is employed the Pirquet test may be more sensitive when a reliable brand of undiluted O.T. is used for the latter. By the intracutaneous method, any two successive tests, done in graded doses, can be compared, which is not possible with the cutaneous test. The International Standard Tuberculin is recommended for general use.

#### *Technique of the test*

Use International Standard Tuberculin or preferably the new Purified Protein Derivate (P.P.D.), the active principle of O.T. isolated in pure form.

Use sterile, normal saline or 0.2 per cent carbolyzed saline for dilution in such a way that 0.1 c.cm. contains the desired dose. Dilutions should be kept in the ice chest and never employed when more than a fortnight old.

The following dilutions are generally employed:—

1/10,000, 1/1,000, 1/100, and 1/10. A well-fitting 1 c.cm. syringe graduated in 20ths with a short, bevelled, intradermal needle is required. The syringe, once filled, holds fluid for 10 tests, the needle being merely wiped with cotton wool soaked in absolute alcohol or flamed between the injections. It is well to have a separate syringe for each dilution.

*Injection.*—Clean the front of the forearm with rectified spirit and allow to dry. Stretch the skin by holding the forearm taut from below, select a point away from superficial veins, insert the needle into the dermis at the smallest angle possible with the bevel upwards and inject 0.1 c.cm. of the dilution. The injection, if properly made, should raise a white bleb, on the surface of which the hair follicles are easily visible. Subcutaneous injections should be avoided as



they may give rise to general febrile reactions. No controls are necessary up to 1/100 dilution. In case of 1/10 dilution, it is better to keep a control with glycerinated veal peptone broth of the same strength, to avoid atypical non-specific reaction.

*Dosage.*—The initial dose may be 0.1 c.cm. of 1/1,000 dilution (which is sometimes called the 'standard dilution'), except for patients

(a) suspected of having bone, joint, ocular and skin tuberculosis or in children with visible cervical nodes, ulcerations or discharging sinuses,  
(b) who have had a recent hæmoptysis,  
(c) who are home-contacts of tuberculosis,  
(d) where their attendance for further tests can be guaranteed, and

(e) who are very young infants, in which case it is advisable to employ the 1/10,000 or an even higher dilution.

Whichever dilution is employed, read result at the end of 48 and 72 hours. If negative, employ the next stronger dilution at the last visit (i.e., at the end of 72 hours). The delay between two tests should not be more than a week. In a large majority of cases, a dilution of 1/100 suffices, but if this gives a negative result a dilution of 1/10 may be employed as the practicable upper limit, as stronger solutions are likely to give non-specific reactions. In case of doubtful reactions, employ the next stronger dilution to settle the result. No test is complete without using the 1/100 dilution, especially for mass investigations.

#### *Reading of the reaction*

Reactions should be read at the end of 48 hours. If negative, they should be re-examined at the end of 72 hours, and if still negative, at the end of 96 hours, when a final opinion might be put down. To read, hold the arm slightly flexed at the elbow and in good light and look across the arm rather than down on it.

A test should be recorded as positive or negative to the given dilution. A positive reaction is indicated by œdema and redness around the site of inoculation. When in doubt, feel with the fingers and gently palpate between them. Its intensity is judged by the amount of œdema (its extent and thickness) and redness and by any elevation of temperature and malaise, if they occur. The area of redness is usually less important than the œdema. In measuring the area of erythematous infiltration of the skin (as judged by palpating between two fingers), reactions with the greatest diameter below 5 mm. are regarded as negative. Four categories or degrees of intensity of the reaction are considered, *viz*:

One plus (+) reaction = slight but defined œdema raised about 1 mm. above skin surface and not more than 10 mm. in diameter.

Two plus (++) = well-defined œdema, raised somewhat more than 1 mm. above skin surface; diameter between 10-15 mm.

Three plus (+++) = more extensive œdema with diameter exceeding 15 mm. and thickness exceeding 1.55 mm. above skin surface; wide area of redness beyond but no vesiculation or necrosis of the skin.

Four plus (++++) = characterized by extensive œdema, redness, vesiculation and necrosis; may be associated with temperature and malaise.

#### *Interpretation*

A positive tuberculin test always means the presence of tuberculous infection.

The positive reaction has its chief value in infancy, when it is more likely to be associated with active tuberculous disease that may lead to a fatal issue. The younger the age, the worse the prognosis.

An infant under 2 years showing a positive reaction, but without symptoms, should be kept under observation for some years on account of the possible development of clinical tuberculosis. Meantime the prognosis should be optimistic, though guarded. If, however, obscure and persistent symptoms like unexplained pyrexia or loss of weight are present, the origin might probably be tuberculous and a more serious view should be taken until time shows this to be unwarranted.

A positive reaction in a child aged 2 to 5 or even 10 years with persistent symptoms should suggest that these symptoms are tuberculous in origin. A weightage towards positive significance in interpretation should be given in cases of children in rural and semi-rural areas. An infected or improperly immunized adult in a remote rural area in India may, however, behave like an urban child with regard to hypersensitiveness.

Where a patient over 5 years gives a positive reaction to a qualitative test, it must not be concluded that clinical tuberculosis is present. In such cases, the positive reaction has its principal diagnostic value when elicited by quantitative intracutaneous tests made with weak solutions of tuberculin (e.g., by 1/50,000 and 1/100,000 dilutions), especially in rural people or hill tribes and in dermatological conditions. Quantitative tests are of doubtful value for estimating the prognosis in clinical tuberculosis.

The principal application of tuberculin tests in clinical practice is for a negative diagnosis or the exclusion of clinical tuberculosis. Failure to get a positive reaction does not always exclude tuberculosis. In spite of harbouring living tubercle bacilli in the body, a negative test may be obtained where the dose of tuberculin has been too small to elicit a reaction or where the reaction has been done during the ante-allergic period or where the immunity is depressed or absent in certain clinical conditions like acute infectious diseases, pregnancy, cachexias and advanced tuberculosis a few days before death, or in acute miliary or generalized tuberculosis.

Tuberculin tests are of great value in 'contact' cases, both for detecting infection in infants and for excluding tuberculosis in these and older children. In testing contact children of tuberculous families, make a routine test on negative cases at six monthly intervals, to determine the time when they are infected. Children still negative at 4 to 5 years may be given a good prognosis. The prognosis should be guarded when infants under 2 years react positively and when obscure symptoms persist for some time. A positive reaction in a young child aged 2 to 5 or even 10 years with persistent symptoms should suggest that these symptoms are tuberculous. About this age, children who give a positive reaction to 1/10,000 or weaker dilutions should be viewed with suspicion and should be x-rayed. If impaired health and conspicuous underweight are noticed in these children, they should receive special care in diagnosis and treatment. If several positive reactors are found among the children in a family, suspect a 'carrier' in the house.

N.B.—The International Standard Tuberculin is available at the following places:—

Beckenham (England) ..	Wellcome Physiological Research Laboratory.
Hampstead (London) ..	National Institute for Medical Research.
Paris ..	Institut Pasteur.
Copenhagen ..	Statens Serum Institut.
Frankfort-on-Main ..	Staatliches Institut für Experimentelle Therapie.

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## THE INCREASING VALUE OF MODERN SANATORIUM TREATMENT AS JUDGED BY THE AFTER-HISTORIES OF THE PATIENTS

By C. FRIMODT-MÖLLER, M.B., Ch.B. (Copenhagen)  
 Medical Superintendent, Union Mission Tuberculosis Sanatorium, Arogyavaram, near Madanapalle

MODERN sanatorium treatment differs in many ways from sanatorium treatment of earlier days, not in the principles of treatment but in the way of carrying them out. The ability to carry them out in a better way than formerly is the cause of the increasing value of the treatment, as may be seen specially in the results of treatment of many of the most advanced cases, previously not benefited by it.

It remains as true as ever that the earlier a case of pulmonary tuberculosis comes under proper treatment, the shorter is the length of treatment necessary and the better the results obtained. Nevertheless, in the last few years sanatorium treatment has developed so rapidly that now it is often in many of the most advanced and desperate cases that very striking results are obtained.

The increasing value of modern sanatorium treatment is obvious from the immediate results of treatment, but is much more convincingly borne out by an investigation of the after-histories of the patients, which investigation shows that the results obtained at the time of discharge are not only better, but more lasting.

It may not be out of place, before going into the question of the after-histories, to summarize briefly what we mean by modern sanatorium treatment as compared with sanatorium treatment in former days.

The principle of sanatorium treatment—the very backbone of it, so to speak—is the change between rest and graded exercise in the right proportion in each individual case. The control of this change depended previously only upon the observation of the various clinical symptoms of the patient and the stethoscopical examination of the lungs. The modern sanatorium treatment has added two more very important methods of controlling the change. The first of these is the x-ray examination by x-ray photos and by fluoroscopic examinations of the chest, each supplementing the other.

(Continued from previous column)

- Ukil, A. C. (1930). *Ibid.*, Vol. XVII, p. 849.  
 Ukil, A. C. (1930). *Bull. Soc. Path. Exot.*, Vol. XXIII, p. 5.  
 Ukil, A. C. (1931). *Tubercle*, Vol. XII, p. 244.  
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The second method is various blood examinations. In our opinion repeated blood examinations give more valuable information with regard to the control than any of the other methods.

Advances have been made not only in the control of the treatment but even in the treatment itself—in the ability to produce rest for a diseased lung to an extent never thought of before. Formerly, the only way of creating rest for the lung was to keep the patient in bed which, at the best, only provided a very partial rest and was in consequence totally insufficient in many cases. In the modern treatment it is possible to give rest to the lung inside the patient by, as it were, bandaging the lung and so preventing its movement. This immobilization is created by various forms of modern lung surgery.

While in the drug treatment of the disease comparatively little advance has been made, yet in the use of gold salts there has been found a remedy which in selected cases, specially when combined with artificial pneumothorax treatment, has proved to be of great value.

That the widening field of the usefulness of modern sanatorium treatment is gradually being understood is shown by the increasing number of admissions to the sanatoria, from year to year, of patients in the most advanced stage of the disease, which is a feature found all over the world. The increased admission of patients in the third stage of the disease is also seen in this sanatorium, as shown in the following table:—

TABLE I

*The stages of the disease in 4,308 patients admitted during 1916 to 1935*

Five-year periods	Patients admitted	I stage, per cent	II stage, per cent	III stage, per cent
1916-20	807	29.5	46.5	24.0
1921-25	737	19.8	25.6	54.6
1926-30	1,231	22.5	24.3	53.2
1931-35	1,533	15.9	16.9	67.2

It will be noticed from table I that during the last 15 years more than half the patients admitted were in the most advanced stage. During last year, 1935-36, even 72.2 per

cent of the patients admitted were in the third stage.

The ability of the discharged patients to survive and to return to their normal conditions of life is the final test of the real value of sanatorium treatment which cannot be judged merely by the immediate results obtained at the time of discharge. For the purpose of such a test an investigation of the after-histories of the patients over a period of five years is sufficient. The reason for this is that investigations in the West, as also our own, have shown that the greatest number of patients who die after discharge die within the first two years after leaving the sanatorium, and that patients living more than five years rarely die of tuberculosis. We find that of 2,390 patients discharged during 19 years, whose fate is known, 680 died, but of these not less than 561 died within the first two years. Only 30 of them died of tuberculosis after a period of five years.

Everyone familiar with Indian conditions will understand the difficulty of tracing many of the patients after they have left the sanatorium. We have, nevertheless, been able to collect information of about 1,695 out of 2,604 patients who have been treated more than one month in the sanatorium, being therefore included in the medical statistics, and who have been away from it for at least five years after discharge. We believe that this considerable number of untraceable patients does not, however, affect the reliability of our investigation to such an extent as one might be inclined to think at first. The reason for this belief is deduced from the figures given in table II.

From this table it will be seen that the untraceable patients are distributed approximately in the same proportion over the three stages and over the immediate results on discharge in each stage.

The percentage of untraced patients is 34.9 for the whole group of 2,604 patients discharged during 1916 to 1930, and in most of the stages and in their subdivisions the percentage is almost the same. Although this comparatively large percentage of unknown results is unsatisfactory, yet we have to work with the facts available in order to get some information about the after-results of the treatment, and, in our opinion, from what we have stated above, there is

TABLE II

*Immediate results on discharge of 2,604 patients treated during 1916 to 1930*

			Arrested	Much improved	Improved	Worse	Total number
I stage, 648 patients ..	{	Traced	340	66	24	11	441
		Untraced	151	33	18	5	207
II stage, 840 patients ..	{	Traced	180	188	62	74	504
		Untraced	91	132	57	56	336
III stage, 1,116 patients ..	{	Traced	8	231	163	348	750
		Untraced	8	105	69	184	366

reason to suppose that the proportion of living and dead would not be materially different in the untraced group of patients from what it is in the traced one.

Confining ourselves to the traceable patients we find that out of 1,695 patients who have been away from the sanatorium at least for five years, 898 or 53.0 per cent were alive after five years. Of these patients 819 were doing full work. These figures include the most advanced cases.

The value of modern sanatorium treatment is, after all, not brought out quite satisfactorily in this way by considering the percentage of patients living five years after discharge out of the total number of patients, irrespective of the stage of the disease they were in on admission and of the results of treatment obtained at the time of discharge. It is brought out far better by taking these facts into consideration which are done in the following table:—

five years after, and of those discharged as 'improved' as many as 25.1 per cent.

The great progress in the usefulness of the modern sanatorium treatment is, however, best demonstrated by considering each of the three five-year periods separately and comparing the results. In doing this we have grouped together as 'clinically well' those patients discharged as 'arrested' and 'much improved' in each stage, as we have already seen from table III that these are the patients who at the time of discharge have the best prognosis for the future.

There are some interesting facts to be derived from a study of this table.

The first one is the increasing percentage of those discharged as 'clinically well' through the four quinquennial groups, the only exception being those discharged in the II stage during 1926 to 1930.

The second interesting fact is that this improvement in the immediate results of treatment is a real one as proved by the after-histories.

TABLE III  
*The after-histories of 1,695 patients traced five years after discharge*

	ARRESTED			MUCH IMPROVED			IMPROVED			WORSE		
	Traced	Living	Per cent	Traced	Living	Per cent	Traced	Living	Per cent	Traced	Living	Per cent
I stage												
1916-20	107	93	86.9	22	16	72.7	13	10	76.9	2	0	..
1921-25	79	70	88.6	26	23	88.5	3	2	66.7	5	0	..
1926-30	154	144	93.5	18	15	83.3	8	7	87.5	4	0	..
1916-30	340	307	90.3	66	54	81.8	24	19	79.2	11	0	..
II stage												
1916-20	82	67	81.7	59	33	55.9	24	12	50.0	39	9	23.1
1921-25	38	33	86.8	50	42	84.0	18	9	50.0	14	2	14.3
1926-30	60	52	86.7	79	60	75.9	19	9	47.4	22	2	9.1
1916-30	180	152	84.4	188	135	71.8	61	30	49.2	75	13	17.3
III stage												
1916-20	3	1	..	28	10	35.7	25	3	12.0	62	2	3.2
1921-25	2	2	..	62	35	56.5	64	16	25.0	137	2	1.5
1926-30	3	3	..	141	90	62.9	74	22	29.7	149	2	1.3
1916-30	8	6	..	231	135	58.4	163	41	25.1	348	6	1.7

From a study of table III it will be seen that of the patients in first stage discharged as 'arrested', not less than 90.3 per cent were living five years after leaving the sanatorium, of those discharged as 'much improved' 81.8 per cent and of those discharged as 'improved' 79.2 per cent.

In second stage the corresponding percentages are 84.4, 71.8 and 49.2.

In third stage the number of 'arrested' is too small for the percentage to be of value. Of the patients in this, the most advanced stage, we find that of those discharged as 'much improved' not less than 58.4 per cent were living

The more lasting effect of the immediate results of treatment is specially to be observed among the patients in III stage who are the most advanced and often desperately sick cases. It is a great improvement that in the 1926 to 1930 group 34.3 per cent are discharged as 'clinically well' compared with 23.1 in 1921 to 1925 and 24.7 in 1916 to 1930, but this improvement is nearly doubled in permanence in the last group where it is seen that 64.6 per cent are alive and well five years after discharge compared with 35.5 per cent in the group 1916 to 1920. From this it will be understood how much more lasting is the improvement which is gained under modern sanatorium treatment.

TABLE IV

2,291 patients discharged as 'clinically well' with their after-histories

Years	I STAGE					II STAGE					III STAGE				
	Number of patients discharged as 'clinically well'	Per cent	Number of those traced	Number living five years after discharge	Living per cent	Number of patients discharged as 'clinically well'	Per cent	Number of those traced	Number living five years after discharge	Living per cent	Number of patients discharged as 'clinically well'	Per cent	Number of those traced	Number living five years after discharge	Living per cent
1916-20	207	86.9	129	109	82.9	235	62.7	141	100	70.9	48	24.7	31	11	35.5
1921-25	122	93.1	105	93	88.6	135	73.6	88	75	85.2	84	23.1	64	37	57.8
1926-30	247	94.8	172	159	92.4	217	76.3	139	112	80.6	211	34.3	144	93	64.6
1931-35	203	95.3	..	..	..	192	81.0	..	..	..	390	38.5	..	..	..

It is most encouraging that it is now possible to say that more than half the number of patients in the most advanced stage, if treated in an up-to-date sanatorium and discharged as 'much improved', will probably live and work five years after discharge, and we know that if they live so long, they will probably not die of tuberculosis.

The fact that so much can now be done for patients in the advanced stage of tuberculosis, when treated in an up-to-date sanatorium, is not fully realized by the medical profession, nor is it widely known by the tuberculous patients themselves. The result of this is that many patients in the advanced stage, instead of getting the proper treatment, succumb to the disease continuing to their death to be the most dangerous sources of infection to their surroundings and to the public at large.

#### Summary

1. It is shown that modern developments are making sanatorium treatment of increasing value. This is demonstrated by considering—

(a) the immediate results of treatment on discharge of 4,308 patients treated during the years 1916 to 1935.

(b) the after-histories of 2,604 patients, that is, omitting from the 4,308 patients 1,533 who have not yet been away five years from the sanatorium, and 177 who died before discharge in the years 1916 to 1930.

2. Out of 2,604 patients discharged during 1916 to 1930, 1,695 were traced. For reasons given the untraceables are omitted in the statistics analysed.

3. Of the 1,695 patients traced 898 or 53 per cent were alive five years later and 91 per cent of these were doing full work.

4. The value of modern sanatorium treatment is better and more correctly brought out by considering the after-histories in relation to the stage of the disease and the results of treatment on discharge. In I stage of those discharged as 'arrested', 'much improved' and 'improved', 90.3, 81.8, and 79.2 per cent respectively were alive five years after discharge: in II stage 84.4, 71.8, and 49.2 per cent: in III stage of those discharged as 'much improved' 58.4 per cent and of the 'improved' 25.1 per cent.

5. Consideration of the patients divided into four quinquennial periods emphasizes the improvement of results which had followed modern development of treatment. There is seen a steadily increasing percentage from period to period of those discharged as 'clinically well' (that is 'arrested' and 'much improved' grouped together); in I stage the figure being 95.3 per cent for the period 1931 to 1935 as compared with 86.9 per cent for the period 1916 to 1920; in II stage 81.0 per cent as compared with 62.7 per cent; and in III stage 38.5 per cent as compared with 24.7 per cent for the same periods.

6. Most striking is the increase in the lasting effect due to modern treatment. This is seen best of all among the most advanced cases. Of those discharged as 'clinically well' as many as 64.6 per cent of the period 1926 to 1930 were living five years after as compared with 35.5 per cent from the period 1916 to 1920 and 57.8 per cent from 1921 to 1925.

7. Modern sanatorium treatment is increasingly able to save the lives of tuberculous patients, even a great many of those in the most advanced stage of the disease, and to return them to normal conditions of life in a way which was absolutely impossible in earlier days.

## SOME OBSERVATIONS ON CHRYSOTHERAPY IN PULMONARY TUBERCULOSIS

By J. C. BANERJEA, M.B. (Cal.), M.R.C.P. (Lond.)  
Honorary Junior Visiting Physician, Medical College  
Hospitals, Calcutta

It is just a decade since Mollgaard of Copenhagen discovered the gold treatment of pulmonary tuberculosis in 1924. Great enthusiasm swept over the medical world and the sanocrysin treatment of Mollgaard was taken up by the specialists in tuberculosis of nearly every country with high hopes of success, but, as time passed on, the enthusiasm gave place to depression. Follow-up of the cases treated in the earlier years revealed unfavourable results at the hands of nearly all the experts and so the treatment was given up for the time being. The French school, however, headed by Leon Bernard and Dumarest, persisted in this method of treatment, using gold salts of lower toxicity than sanocrysin and in smaller doses. They have reported favourable results in 50 to 60 per cent of cases, but the experiences of other workers on this method of treatment differ widely and in spite of so much work the value of gold treatment remains still unproven.\* In America it is much less thought of and less utilized. But in India we find that gold treatment is being tried with great zeal both by general practitioners and by specialists. It is high time that we should be using this method of treatment with caution and discretion and should pause to take stock of our experiences from time to time. With these thoughts in mind I took up the present study which is based on personal observations in a series of sixty cases.

### Selection of cases

It is essential to remember that the whole success or failure of chrysotherapy depends on the selection of cases. It is unanimously agreed that (1) cases with recent exudative lesions are most suitable for gold therapy. Only a few cases, however, are seen by us at this stage, and, if we limit the use of gold salts to this group, we shall find that about 10 to 20 per cent of cases will receive this treatment. With

discretion the treatment may be extended to (2) a second group where it is desirable to collapse one lung by artificial pneumothorax or phrenic evulsion and to check the progress of recent lesions in the other lung. There is yet a third group (3) where the use of gold salts has been advocated to check the acute exacerbations of a chronic fibrotic type of case.

### Contra-indications

It must be emphasized that cases showing markedly toxic symptoms with high fever, gastro-intestinal lesions and renal lesions, as well as cases with marked emaciation, are not suitable for chrysotherapy. I would like to point out that cases with recurrent attacks of hæmoptysis are unsuitable for gold treatment, though many workers do not think hæmoptysis to be a contra-indication. Involvement of the larynx by itself does not contra-indicate the use of gold salts and I have had one such case where the pulmonary and the laryngeal lesions showed considerable improvement under chrysotherapy and the improvement has been maintained till now, a period of one year.

In my series the cases selected for chrysotherapy may be grouped as follows under five headings:—

- |  |    |    |
|--|----|----|
| (1) Recent exudative cases   | .. | 13 |
| Unilateral   | .. | 4  |
| Bilateral  | .. | 9  |
| (2) Cases suitable for artificial pneumothorax which however could not be induced because of pleural adhesions   | .. | 6  |
| Unilateral   | .. | 4  |
| Bilateral  | .. | 2  |
| (3) Advanced cases unsuitable for artificial pneumothorax  | .. | 19 |
| (4) Cases where artificial pneumothorax was carried out on one side and gold treatment resorted to for checking the progress of recent lesions on the other side or to promote healing of uncollapsed diseased areas | .. | 17 |
| (5) Phrenic evulsion cases   | .. | 5  |

### Mode of action of gold salts

The mode of action of gold salts in pulmonary tuberculosis is obscure. Mollgaard's original idea that gold salts have a direct bactericidal action *in vivo* has not been confirmed by experimental observations. Feldt believes that gold accelerates the complex defensive mechanisms of the host by an activation of the cells of the reticulo-endothelial system which is chiefly concerned in the production of immunity. Apart from these theories, there are certain demonstrable effects on the blood, such as (1) decrease of the sedimentation rate of the erythrocytes, (2) increase of total leucocytes with lymphocytosis and decrease or slight increase of monocytes. These blood changes

\*The author's conclusions are based chiefly on cases treated with intramuscular injections of solganal B. oleosum; comparative figures for cases without gold therapy have not been included as controls. Many workers in India, particularly those at the Madanapalle Sanatorium, will not subscribe to the author's statement that 'the value of gold treatment still remains unproven'. The success of gold therapy, particularly with intravenous injections of sanocrysin, depends not only on the selection of cases but also on careful observation by repeated examinations of the urine, on the blood-sedimentation index, and on other tests. Because it requires great care in the selection of cases and management of treatment, gold therapy should not be condemned. Even in the author's series, 58 per cent of the cases showed definite improvement.—EDITOR, I. M. G.



are favourable. There are other changes which are unfavourable and in such cases gold salts should be stopped. These are (a) rise of the polymorphonuclear count and eosinophilia, and (b) diminution of the blood platelets.

#### *Preparations and mode of administration*

There are various preparations of gold salts on the market and any of the following may be used provided the dosage is carefully regulated :—

Sanocrysin (double thiosulphate of gold and sodium).

Crisalbine.

Solganal B.

Oleo-sanocrysin.

Solganal B. oleosum.

In the present series of cases I used solganal B. oleosum in 55 cases, oleo-sanocrysin in 3 and lophon in 2. One cannot definitely lay down a scheme of dosage which will suit all cases. The dosage and interval have to be modified according to (a) the general condition of the patient, (b) weight of the patient, (c) extent and type of disease and (d) reactions of the patient. In a febrile case it is desirable to begin with a small dose 0.002 gm. by the intramuscular route and increase it by 0.002 gm. at intervals of four to six days, provided no reactions supervene. In an afebrile case we may start with 0.01 gm. and use double the dose every week till 0.4 gm. is reached and this last dose is repeated at weekly intervals until a total dosage of 5 to 6 gm. is administered. Then, after an interval of two months, a second course of 5 gm. is given, if necessary. Unfortunately it has been found that many cases cannot tolerate gold injections, even in very low dosages. In others, 20 per cent in my series, treatment had to be abandoned in the middle of a course because of unfavourable reactions, such as rise of temperature of more than two degrees above the previous level and continued for more than a week, hæmoptysis, stomatitis and dermatitis. In the early years when dosage was high, severe reactions were frequent. Now, we generally use a low or moderate dosage. K. Secher (1931) however believes that many poor results of gold treatment are due to the low dosage and therefore he advocates larger dosages which cause some reaction.

The complications that might arise during chrysotherapy have been stated to be numerous, viz:—

(a) Febrile reactions.

(b) Gastro-intestinal—ulcers of mouth and lips, loss of appetite, nausea, vomiting, and diarrhœa.

(c) Circulatory—collapse.

(d) Renal—albuminuria; red blood cells and casts in urine.

(e) Hepatic—jaundice.

(f) Joint complications.

(g) Skin—rashes—morbilliform, erythematous, or purpuric [22 cases recorded recently in literature (Hudson, 1935)]; herpes, pruritus or pigmentation.

In the past, when larger dosages were used, the complications were frequent, but with the use of smaller dosages and of oily preparations they are few and mild. The commonest that I have come across have been febrile reactions and mild gastro-intestinal symptoms. In one case, I saw an erythematous rash all over the body, more marked on the extremities, on the third day after injection. In another, I have seen slate-grey pigmentations of the skin of the back and the abdomen appearing after the seventeenth injection and persisting for over three years. In a third I have seen severe stomatitis and gingivitis. Apart from the occasional appearance of albumin in the urine I have not seen any marked renal complication.

#### *Results of chrysotherapy*

It is extremely difficult to assess the value of any anti-tuberculous remedy unless we adopt the same criteria of clinical improvement or cure. A patient is clinically considered to be cured when there is anatomical healing with disappearance of toxæmia and return to normal living and working conditions. Results of any method of treatment should be assessed at the end of five years, if not at the end of ten years. Hence a follow-up of the treated and untreated cases is essential for the evaluation of chrysotherapy. From this point of view my observations are not likely to yield much valuable information inasmuch as they have been made during the last five years. Still the results of gold treatment in my series of 60 cases are presented for the consideration of my medical colleagues.

It will be seen from the table (p. 207) that about 58 per cent of cases showed definite improvement under chrysotherapy. These results agree closely with those of Mayer (1934) who reports improvement in 66 per cent of his 404 cases and with those of Bernard (1932) who reports favourable results in 50 per cent of his series. Even if we leave out of our consideration the cases of temporary improvement we find marked improvement in 25 per cent of the present series. Peters and Short (1935) however have recently published a controlled statistical study on the results of chrysotherapy in the age group 16 to 26 during the last five years and they conclude that gold treatment is of no appreciable value. Regarding the effects of chrysotherapy on the sputum it may be interesting to point out that bacilli disappeared only temporarily and they were present some time or other in about 40 per cent of the cases who received a fairly adequate dose of gold salts.

#### *Reports of a few illustrative cases*

Case 1.—C. P., girl, aged 14 years. Fever and cough for two months; physical examination showed impaired

PLATE IV



Fig. 1. Case 1.—Before gold treatment.



Fig. 2. Case 1.—After gold treatment.

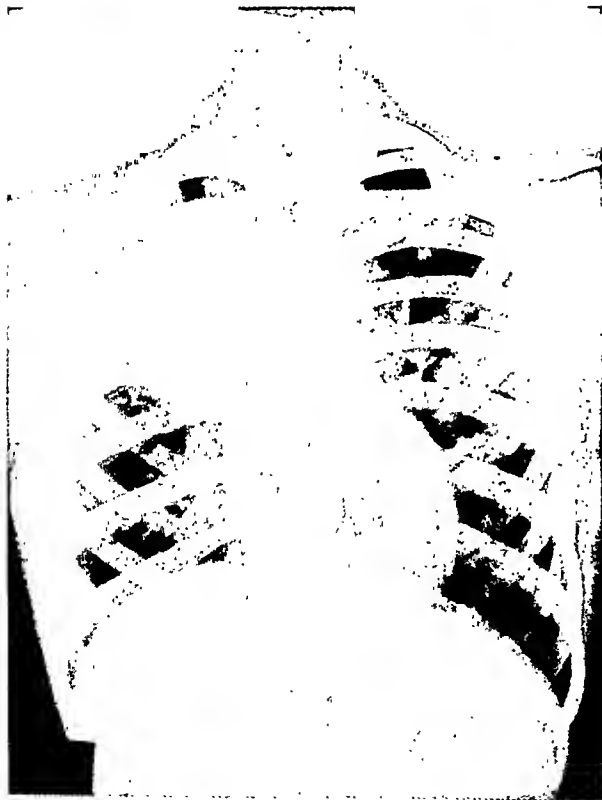


Fig. 3. Case 2.—Before gold treatment.

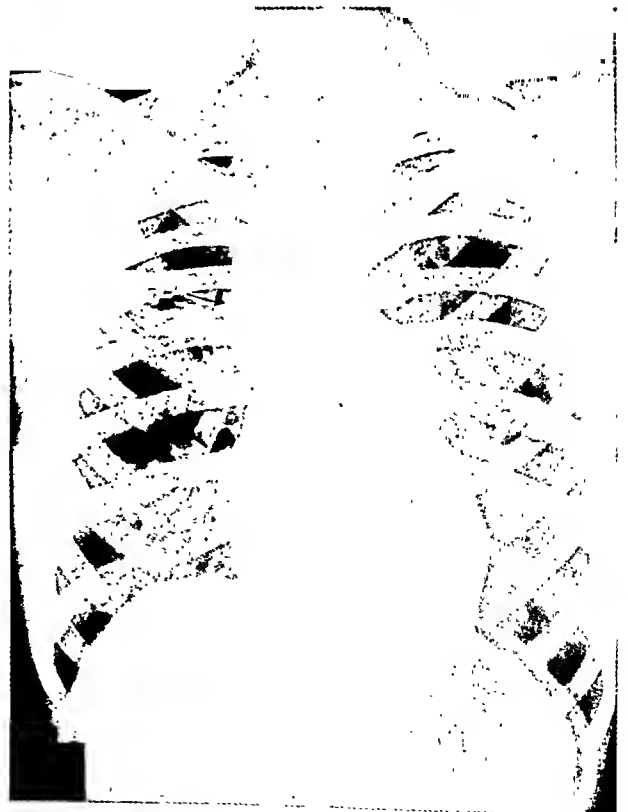


Fig. 4. Case 2.—After gold treatment.

PLATE V

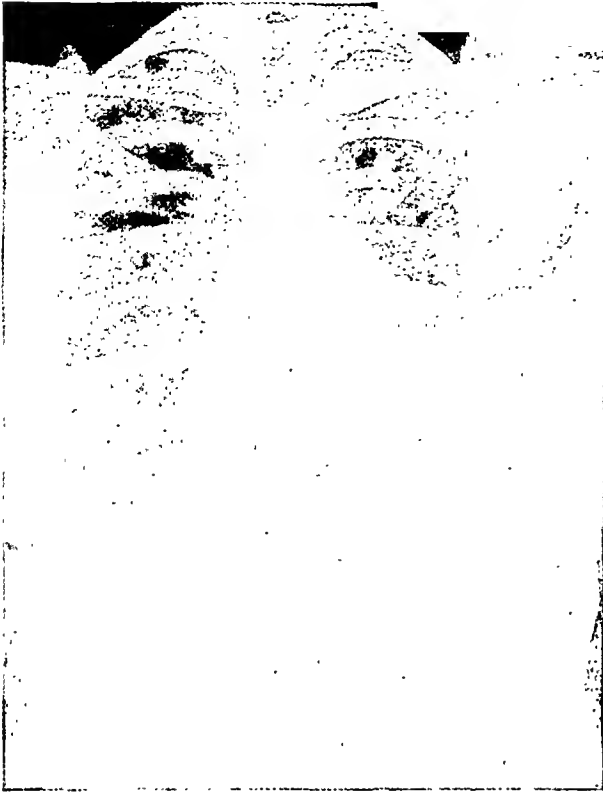


Fig. 5. Case 3.—Before phrenicectomy.

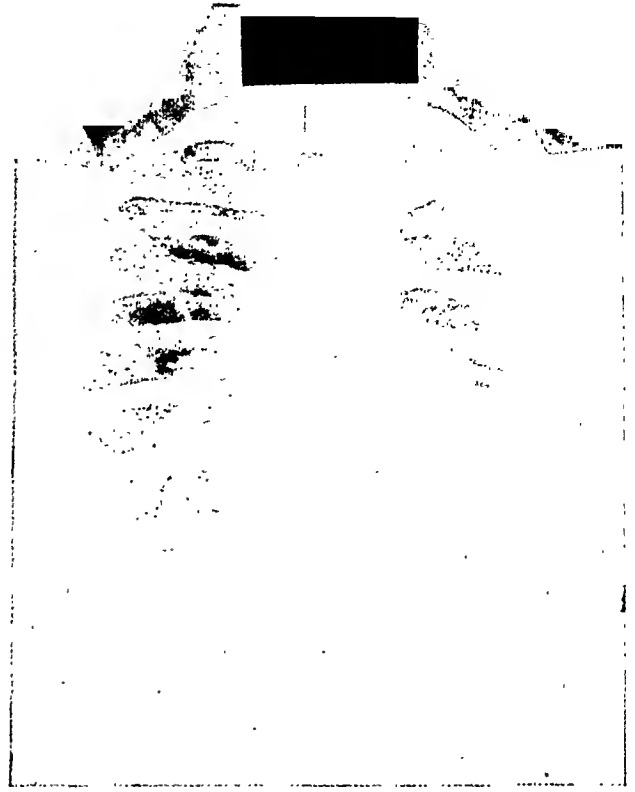


Fig. 6. Case 3.—Four months after phrenicectomy and before gold treatment.



Fig. 7. Case 3.—After five years of gold treatment.

## Results of chrysotherapy

Types of cases	Number	RESULTS			Death in all groups
		Marked improvement, i.e., well for two years	Improvement, i.e., well for six months	No improvement	
I. Recent exudative cases	13	6	6	1	1
II. Cases where A P failed	6	0	2	4	4
III. Cases where A P considered unsuitable.	19	1	6	12	7
IV. A P cases with gold treatment.	17	6	4	7	6
V. Cases of phrenic evulsion with gold treatment.	5	2	2	1	2
	60	15 (25%)	20 (33%)	25 (42%)	20 (33%)

resonance over the left base with diminished breath sounds and a few crepitations. Radiogram of the chest before gold treatment (plate IV, figure 1) showed exudative infiltration left middle and lower zones and over the right middle zone. Another radiogram (plate IV, figure 2) taken after the administration of a total dosage of two grammes of solganal B. oleosum by the intramuscular route showed clearing up of the infiltrations to a very great extent.

Case 2.—S. M., boy, aged 20 years, came under observation with fever 100°F. to 101°F., cough and hæmoptysis for two years. A history of contact was present. Clinical examination revealed impaired resonance over right upper zone with diminished breath sounds and a few crepitations. The left lung showed harsh breathing. Sputum showed numerous tubercle bacilli. He was given a total dose of 4.1 gm. of gold salts in the form of solganal B. oleosum in the course of three months. Sputum was free from tubercle bacilli in eight months and there was a gain of one stone and six pounds in weight in the course of one year. A comparison of the radiogram (plate IV, figure 3) taken before treatment with the one (plate IV, figure 4) taken nine months after the completion of a full course of chrysotherapy showed almost a complete resolution of the extensive homogeneous opacity of the right upper lobe, leaving a few strands of fibrosis with some traction of the mediastinum. There was also a complete disappearance of the infiltrations over the left middle zone.

Case 3.—P. S., female, aged 21 years, was seen in October 1931 with fever 99°F. and 100°F., and cough of about one month's duration. There was a history of exposure to an open case of pulmonary tuberculosis in the family. Physical examination revealed impaired resonance, bronchial breathing and crepitations over the infra-clavicular and the axillary regions of the left lung and impaired resonance with weak breath sounds over the base of the right lung. Sputum showed tubercle bacilli in large numbers. The x-rays (plate V, figure 5) showed a cavity over the left upper zone with infiltrations over the upper and middle zones of the same side, few exudative infiltrations over the middle zone of the right side and pleural thickening over the right base. Artificial pneumothorax was tried on the left side but failed due to pleural adhesions. A phrenic evulsion was done on the left side. Three months after the operation the patient was still having a temperature of 99.4°F. in the evening with cough and expectoration. Sputum was still positive to tubercle bacilli. Gold injections were started and a total dose of six grammes was given in the course of five months. At the end of the course sputum was negative to tubercle bacilli. There was a considerable gain in weight. A comparative study of the radiograms taken before and after gold treatment (plate V, figures 6 and 7) showed a marked clearing up of the lesions, both of left and right, with almost a complete disappearance of the cavity over the left sub-apical area. The patient is

well and active till now and the sputum has remained negative persistently for about four years and a half.

## Comments

It may be argued that the first two cases cited above are examples of exudative pulmonary tuberculosis of a benign nature and that resolution might have taken place even without resort to chrysotherapy. But it is possible that in these cases gold salts accelerated the natural process of healing by resolution. The beneficial effects of gold therapy in the third case were, however, very striking and it is doubtful whether such a marked improvement would have been effected so quickly by the phrenic evulsion alone combined with the conservative treatment of rest, fresh air and good food.

## Summary

From an analytical study of 60 selected cases treated with gold salts it appears that marked improvement occurred in about 46 per cent of the cases with recent exudative lesions and in 25 per cent of the whole series. Such results are obtainable only when chrysotherapy is considered not as the sole curative agent but as an aid to the conservative regimen of rest, good food and fresh air or to some form of collapse therapy, such as artificial pneumothorax, phrenic evulsion and localized thoracoplasties.

In conclusion, I take this opportunity of offering my sincerest thanks to Lieut.-Col. E. H. Vere Hodge, i.m.s., Professor of Medicine, Medical College, Calcutta, for his valuable suggestions and to Lieut.-Col. T. C. Boyd, i.m.s., Superintendent, Medical College Hospitals, for his kind encouragement. My thanks are also due to Lieut.-Col. B. G. Mallia, i.m.s., Superintendent of the Howrah General Hospital, for his kind permission to utilize the case records of the tuberculosis ward of the hospital.

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## AN ANALYSIS OF ARTIFICIAL PNEUMOTHORAX TREATMENT IN 1,039 PATIENTS

By C. FRIMODT-MÖLLER, M.B., ch.B. (Copenhagen)  
*Medical Superintendent, The Union Mission Tuberculosis Sanatorium, Arogyavaram, near Madanapalle*  
 and

M. C. VERGHESE, M.B., B.S. (Andhra)  
*Junior Assistant*

IN this analysis the results of artificial pneumothorax treatment tried in 1,039 patients treated in the Union Mission Tuberculosis Sanatorium, Arogyavaram, and discharged between 1921 and 1st October, 1936, are reviewed. This analysis reveals not only the value of this treatment under Indian conditions in a very convincing way, but brings out as well several facts regarding the indications for it which should be of great interest to doctors in India. Many of them do not know which patients are most in need of pneumothorax treatment, nor do they understand that many patients attacked by the disease in both lungs simultaneously can still benefit considerably from it.

### *The basis of the analysis*

It is of little use to judge a certain kind of treatment without giving it sufficient time to produce its effect, if the nature of the disease

anyone with experience of pulmonary tuberculosis will know how often such an improvement turns out to be merely temporary without any real influence on the ultimate progress of the disease. It is therefore necessary for at least three months to elapse before the real value of any form of treatment can be judged.

The 1,039 patients included in this analysis are divided into two groups, the one comprising 690 patients who have been treated more than three months, and the other 349 patients who were selected for pneumothorax treatment but who could not receive it on account of lack of free space in the pleural cavity due to adhesions. Apart from the pneumothorax treatment these two groups of patients lived and were treated under exactly the same conditions. Therefore the second group can reasonably be used as a control group for judging the value of pneumothorax treatment.

### *The general results*

The general results of the treatment as compared with the results obtained in the control group are tabulated in table I, according to the stages of the disease of the patients on admission.

It will be seen from the table that 959 out of 1,039 patients selected for pneumothorax treatment were in III stage. There were, however,

TABLE I

*The results of pneumothorax treatment in 690 patients as compared with those in a control group of 349 patients*

Stage	Number of patients	ARRESTED		MUCH IMPROVED		IMPROVED		STATIONARY		WORSE		DIED	
		No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent
I	Treated with A. P. 3	..	..	2	..	1	..	..	..	..	..	..	..
	Controls 3	..	..	1	..	..	..	..	..	2	..	..	..
II	Treated with A. P. 50	2	4.0	38	76.0	4	8.0	1	2.0	4	8.0	1	2.0
	Controls 24	..	..	12	50.0	5	20.9	2	8.3	3	12.5	2	8.3
III	Treated with A. P. 637	..	..	318	42.9	124	19.5	63	9.9	73	11.5	59	9.2
	Controls 322	..	..	84	26.1	47	14.6	81	25.2	58	18.0	52	16.1

Of the patients treated with pneumothorax 71 per cent obtained 'positive results' while of those not treated with it only 43 per cent.

is such that no speedy curative result can be expected of any treatment. In a disease like pulmonary tuberculosis no definite progress towards health can be obtained unless fibrotic tissue has been formed in and round the tubercular foci in the lungs sufficiently to wall them in, thereby preventing the tubercle bacilli and their products from penetrating into the surrounding tissue or from flowing into the blood circulation. This process of formation of fibrotic tissue takes considerable time.

It is quite possible with many remedies to get, within a few weeks, an almost dramatic improvement in the symptoms of the disease but

6 patients in I stage and 74 in II stage whose disease was of such an active nature that pneumothorax treatment became indicated.

In the table very few patients are classified as 'arrested', but this is not surprising considering that the disease in the patient treated was of a very severe type, nor is it disappointing when we know that a great many patients discharged as 'much improved' have great prospect of doing well in later life. This is shown by another investigation where 58.4 per cent of III stage patients discharged as 'much improved' are found to be alive and well five years after discharge.

A study of table I reveals, further, that of the patients that received pneumothorax treatment 71 per cent obtained 'positive results', as compared with only 43 per cent in the control group.

The greatest difference between the two groups is seen in the patients in III stage where 49.9 per cent of those treated with pneumothorax were discharged as 'much improved' as against 26.1 per cent in the control group. This is a most striking demonstration of the value of this form of treatment.

Equally convincing facts are brought out by considering the results of the treatment with regard to the disappearance of fever and of tubercle bacilli from the sputum. This is shown in table II.

The importance of instituting pneumothorax treatment while one lung only is attacked is brought out very strongly in this table where it is seen that of the patients in the group with no disease in the contralateral lung, 88.5 per cent obtained 'positive results' as against 48.9 per cent in the group where both lungs of the patients were affected.

It would, nevertheless, be a great mistake to think that pneumothorax treatment cannot be given with beneficial results in many patients whose two lungs are attacked. The very fact that 48.9 per cent of such patients obtained positive results by pneumothorax treatment, as against 34.7 per cent of those with both lungs affected in the control group, is a proof of its

TABLE II

*Results of pneumothorax treatment of 690 patients compared with 349 control cases with regard to the disappearance of fever and of tubercle bacilli from sputum*

	DISAPPEARANCE OF FEVER			DISAPPEARANCE OF TUBERCLE BACILLI FROM SPUTUM		
	Patients with fever when artificial pneumothorax started or tried	Of these, discharged with no fever		Patients with tubercle bacilli in sputum when artificial pneumothorax started or tried	Of these, discharged with no tubercle bacilli in sputum	
		Number	Per cent		Number	Per cent
690 patients treated with pneumothorax.	577	369	63.8	669	364	54.4
349 patients selected for artificial pneumothorax but not treated serving as controls.	307	109	35.5	338	70	20.7

*Pneumothorax treatment and disease in the contralateral lung*

It will easily be understood that a better result of pneumothorax treatment is likely to be obtained when one lung only is attacked than when the contralateral lung is diseased as well. The 690 patients treated are therefore grouped to investigate this point. The results are seen in table III.

value in such cases also. In many it will be found that the contralateral lung heals up simultaneously with that under collapse. The reason is that the resisting power of the patient towards the disease is greatly improved when the pneumothorax prevents the flow into the whole body of toxins and tuberculous protein from the more diseased lung. But in a considerable number of cases the contralateral lung,

TABLE III

*Results of pneumothorax treatment of patients without and with contralateral lung involved*

Pneumothorax patients with contralateral lung	Number	ARRESTED		MUCH IMPROVED		IMPROVED		STATIONARY		WORSE		DIED	
		No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent
Not involved ..	383	2	0.5	277	72.3	60	15.7	16	4.2	15	3.9	13	3.4
Involved ..	307	..	..	81	26.3	69	22.4	48	15.6	62	20.2	47	15.5

With the contralateral lung not involved 88.5 per cent 'positive results'.  
With the contralateral lung involved 48.9 per cent 'positive results'.



if much diseased, will become worse as it cannot stand the strain of taking over the greatest part of the respiration, even if the pressure used in the pneumothorax is kept as low as possible.

In all cases where the x-ray examination shows a considerable amount of cavitation pneumothorax treatment should be tried, at once, if the contralateral lung is either not attacked at all or only a little attacked (examples: plates VI and VII). Should there be found cavities in both lungs it is often possible to treat the worst lung first and, when it has sufficiently improved, then to begin pneumothorax in the other side, after stopping the treatment in the first side, or continuing it simultaneously in both sides. This has been tried also in this sanatorium and with promising results, but the figures are at present too small for publication.

#### *Pneumothorax and gold treatment*

When the contralateral lung shows signs of being attacked, before pneumothorax is given or during the course of treatment, good results can in many cases be obtained by giving a gold preparation, as for instance sanocrysin, simultaneously with the pneumothorax treatment. The patients who were treated before sanocrysin was introduced, or who could not for various reasons be treated with the drug, serve as a control group. The result of this combined treatment is tabulated in table IV.

TABLE IV

*Combined pneumothorax and sanocrysin treatment in patients with contralateral lung affected compared with control cases*

Patients with contralateral lung attacked	Number	'POSITIVE RESULTS'	
		Number	Per cent
Sanatorium treatment with pneumothorax and sanocrysin.	139	89	64.1
Sanatorium treatment with pneumothorax, but no sanocrysin.	168	61	36.3

It will be found from a study of the table that of the patients in the group where sanocrysin was given as an auxiliary treatment, 64.1 per cent. obtained 'positive results' as against 36.3 per cent in the group not treated with it. This demonstrates the great value of sanocrysin under these conditions.

A strong warning must, however, be given with regard to the use of sanocrysin in general. The drug can be very dangerous when the urine is not examined for albumin at least twice a day during the whole course of treatment. The

reason is that even the slightest nephritis will interfere with the excretion of the gold which may lead to severe symptoms of metal poisoning, if ignored. But, apart from this danger, it must be understood that sanocrysin is a dangerous drug also from its action on the tuberculous tissue itself, if given to a too advanced patient. It is just in such advanced cases, with both sides attacked, that the drug is best used in combination with pneumothorax treatment. The collapse of the more affected side will prevent the sanocrysin from acting, at one time, upon all the tuberculous foci present. Such an action would in much advanced cases bring into the circulation more tuberculous protein than the body could cope with. Preventing, by pneumothorax, the drug from acting on the more advanced lung, sanocrysin can be used with safety for the disease in the contralateral lung. To use sanocrysin in the most advanced cases without simultaneous pneumothorax treatment may have disastrous results.

#### *Selective collapse*

In connection with the question of the effect of pneumothorax treatment on the contralateral lung it should be pointed out that the whole principle of giving pneumothorax has been greatly modified during the years.

Previously the principle was to try to obtain as much collapse of the whole lung as possible, but the aim is now very different. Experience has shown that the best results are achieved when only the diseased portion of the lung is collapsed, while the healthy part of it is allowed to function, thereby relieving the strain on the contralateral lung. This collapse acting only on the diseased portion is called 'selective' (plate VII, figure 6). The name is in one way misleading as it is not the physician who selects which part to immobilize, but Nature herself. The diseased part having lost its elasticity does not expand under a low pressure which is too low to have any effect on the expansion of healthy lung tissue.

The modern principle of giving pneumothorax treatment is to insufflate just so much air as will produce the optimum effect with the minimum pressure. What this pressure is depends on so many individual factors that no general figure can be given. It has to be found in each patient by a careful study not only of the clinical symptoms but also by examination of the lungs stethoscopically and by x-rays, and by a study of the blood by various methods.

#### *The question of adhesions*

One of the most important factors with regard to the results to be obtained in a case of pneumothorax treatment is the presence or not of adhesions in the pleural cavity. Such adhesions, whether present from the beginning or developing during the treatment, will prevent the diseased part of the lung, especially that with

PLATE VI  
(Photos by U. M. T. Sanatorium)



Fig. 1.—Mrs. K. Before pneumothorax; right sub-apical infiltration with large cavity.



Fig. 2.—Same patient after nine months' A P treatment. The large cavity seen much smaller close to the mediastinum in the upper part of the healed fibrotic area.

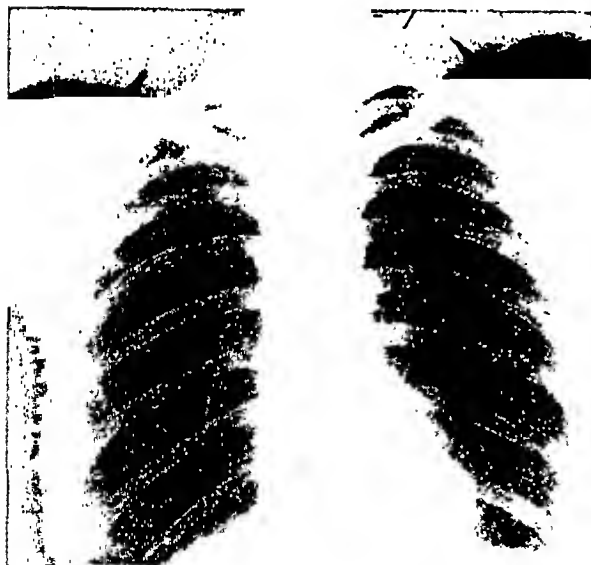


Fig. 3.—Same patient two years after discharge, with re-expanded lung; no cavity seen. Result: Clinically well; sputum, bacilli free.

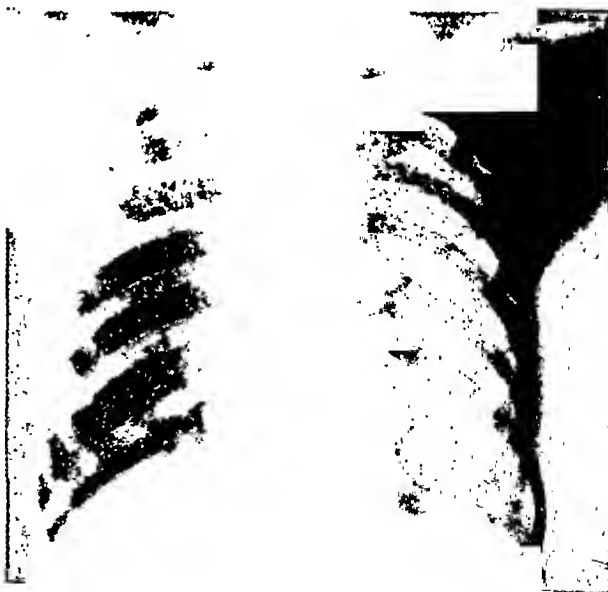


Fig. 4.—Mr. P. V. Before A P. Right lung upper half affected, with large cavity.

PLATE VII  
(Photos by U. M. T. Sanatorium)



Fig. 5.—Same patient after six months' pneumothorax treatment. The cavity seen close to the mediastinum.



Fig. 6.—Same patient six months later, the cavity much smaller, seen in the completely collapsed upper lobe; lower lobe expanded and functioning. A good 'selective' collapse. Result: Clinically well; sputum, bacilli free.

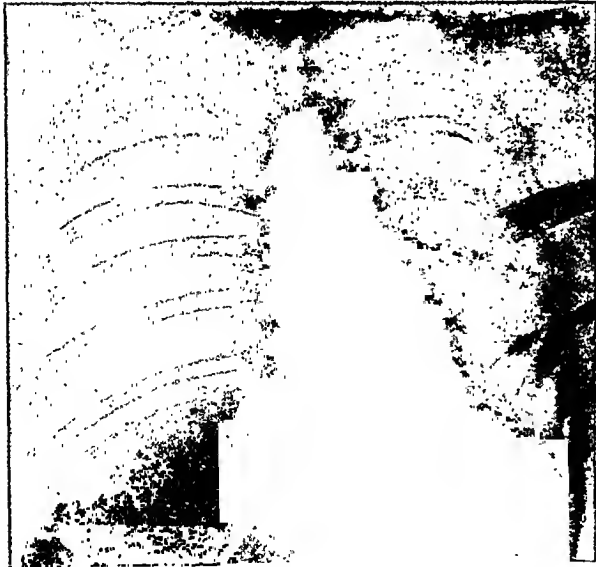


Fig. 7.—Mr. K. K. Before A P. Bilateral tuberculosis; whole left lung affected, with cavities; upper part right lung also affected.



Fig. 8.—Same patient after little over two years' A P; complete collapse of left lung; right fibrosed. Result: Clinically well; sputum, bacilli free.

cavities, from being collapsed. The most injurious effect of the adhesions is not that they keep the cavities open by a direct pull on the visceral pleura over them, but that they prevent the relaxation of the whole tension in the pleural cavity itself. This is a far more important factor in immobilizing the lung than the direct pressure on it by the insufflated air.

In table V are tabulated the results of pneumothorax treatment in relation to the extent of collapse of the lung as seen by x-ray examinations.

or of their liability to produce bleeding. In such cases, as well as when pneumothorax cannot be given at all, the question arises of the phrenic-evulsion operation or of thoracoplasty. In many cases these operations have the desired effect in collapsing the diseased lung with its cavities.

#### *Effusion in the pleural cavity*

Before closing it is necessary to mention the complication of effusion appearing in the pleural cavity during the treatment with pneumothorax.

TABLE V

*The results of pneumothorax treatment in relation to the extent of collapse obtained*

Extent of collapse of lung	POSITIVE RESULTS			DISAPPEARANCE OF FEVER			DISAPPEARANCE OF TUBERCLE BACILLI FROM SPUTUM		
				Patients with fever when artificial pneumothorax started	Of these, discharged with no fever		Patients with tubercle bacilli in sputum when artificial pneumothorax started	Of these, discharged with no tubercle bacilli in sputum	
	Total number	Positive results	Per cent	Total number	Number	Per cent	Total number	Number	Per cent
Complete collapse	41	39	95.1	33	31	94.0	37	31	83.9
Three-fourths collapse	112	88	79.0	95	71	74.7	107	70	65.2
Less than three-fourths	141	84	59.6	124	65	52.4	139	54	38.8

It will be observed how much greater the percentage of positive results is among those patients with a complete collapse as compared with those with even a three-fourths collapse or those with less, the figures being, respectively, 95.1, 79.0, and 59.6 per cent. Similar differences of percentages are observed with regard to disappearance of fever and of tubercle bacilli from the sputum.

When adhesions are found to be present it is of the greatest importance therefore to get rid of them. Previously this was often attempted by increasing the pressure in the hope of stretching the adhesions until they snapped. Some years ago many patients suffered heroically all the disadvantages and detrimental effects of overpressure without having the adhesions broken. This method of trying to remove adhesions should never be used any more.

The only effective way of treating adhesions is by thoracotomy with cauterization. It would carry us too far here to go into details of this treatment.

Unfortunately, it is not always possible for this treatment to be used either because of the position of the adhesions or of the size of them

An analysis of the 690 patients treated with pneumothorax reveals that effusion appeared in 54.2 per cent of the patients. From table VI it will be seen that the more advanced the cases the higher is the percentage with effusion.

TABLE VI  
*Pneumothorax and effusion*

Stages	Number of patients treated with pneumothorax	Number of patients in whom effusion appeared	Percentage
I	3	0	..
II	50	19	38.0
III	637	355	55.7

The effect of effusion on the ultimate results of treatment is fortunately not nearly as detrimental as one is liable to think, as out of 316 cases without effusion 74.4 per cent of the patients obtained 'positive results' and out of 374 cases with effusion as many as 68.0 per cent. The difference is so small that we agree with

some other workers that the appearance of effusion is not of any real serious consequence.

It is of interest to note that the fluid appeared in 61.5 per cent of the cases within the first three months' treatment, in 18.2 per cent within the next three months, while 10.0 per cent only have fluid appearing for the first time after six months' treatment.

The question of any seasonal influence on the appearance of effusion has been investigated by us, but we do not find any evidence of seasonal influence in India worth considering.

### Summary

1. The results of the treatment with pneumothorax of 1,039 patients are reviewed.

2. In the analysis are included only patients treated three months or more, and reasons for this are given. The results of treatment of 690 such patients are compared with those of 349 selected for pneumothorax, but not able to receive it on account of no free pleural space. These patients serve as a control group.

3. Nine hundred and fifty-nine out of the 1,039 patients selected for pneumothorax treatment were in III stage, 74 in II stage and 6 in I stage.

4. 'Positive results' were obtained in 71 per cent in the pneumothorax treated group while only 43 per cent in the control group. Of patients only in III stage 49.9 per cent were discharged as 'much improved' as against 26.1 per cent of those in the same stage in the control group.

5. The importance of giving pneumothorax treatment while only one lung is attacked is demonstrated by 88.5 per cent of such patients having obtained 'positive results' as against 48.9 per cent of those having the contralateral lung affected as well.

6. The value of pneumothorax treatment even in cases with both lungs involved is shown by 48.9 per cent of such patients obtaining 'positive results' as against 34.7 per cent of those in the control group, equally attacked.

7. Pneumothorax treatment should be tried in all cases showing cavities.

8. In patients with affection in the contralateral lung good results are obtained by additional treatment with sanocrysin, as shown by 64.1 per cent of patients treated with this combined treatment obtaining 'positive results' as against 36.3 who for various reasons could not have gold treatment.

9. Strong warning is given against sanocrysin treatment in advanced cases if not combined with pneumothorax treatment and reasons are stated for this.

10. 'Selective' collapse is mentioned and the modern principle of pneumothorax treatment is defined as obtaining the optimum effect

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## THORACOSCOPIC EXAMINATION AND CAUTERIZATION OF ADHESIONS

### (INTRAPLEURAL PNEUMOLYSIS)

By P. V. BENJAMIN, M.B., B.S. (Madras), T.D.D. (Wales)  
Assistant Medical Superintendent, Union Mission Tuberculosis Sanatorium, Arogyavaram, near Madanapalle,  
South India

ADHESIONS preventing sufficient collapse of the lungs are the most frequent causes of partial or complete failure in the treatment of pulmonary tuberculosis by artificial pneumothorax. It is estimated that at least 40 per cent of failures in artificial pneumothorax treatment can be attributed to this cause. Unfortunately adhesions are very often distributed over the more diseased part of the lung which is in greatest need of collapse.

In the earlier years of artificial pneumothorax treatment attempts were made to sever these adhesions by thoracotomy (by the open method). This was attended with many complications and the procedure is not now considered justifiable. In 1910 Jacobsen introduced the present method of intrapleural pneumolysis and invented the instruments for the intrapleural division of adhesions by the closed method by galvano-cautery under the guidance of vision through a thoracoscope.

The thoracoscope is an instrument built on the principles of the cystoscope. In Jacobsen's thoracoscope the lenses are arranged in such a way that the adhesions are seen indirectly by reflection. Others have improved on this and we have now several modifications. Kremer's thoracoscope is a direct-vision one where the

(Continued from previous column)

with the minimum pressure. This is not a constant figure but varies from person to person and is found in each individual case by a study of the clinical symptoms, by stethoscopical and x-ray examinations, and by a study of the blood by various methods.

11. The question of adhesion is investigated. Figures are given indicating the great importance of a complete collapse compared with a three-quarter collapse, and one less than this, as 'positive results' were obtained in 95.1, 79.0, and 59.6 per cent respectively amongst patients in these different classifications. Various methods of treating patients with adhesions are discussed.

12. Effusion in the pleural cavity during pneumothorax treatment is investigated. Fluid appeared amongst 54.2 per cent of the 690 patients treated with pneumothorax. The appearance of fluid is not of serious import as 68.0 per cent of those with fluid obtained 'positive results' as compared with 74.4 per cent of those without fluid.

adhesions are seen directly without any distortion. In Jacobeus' instrument, as the lens is placed on the side, a complete examination of the pleural cavity on all sides can be made easily, but, although the general view is not always so complete with Kremer's thoracoscope, this instrument gives a better orientation of the adhesions, their direction and position, and is a much easier one to work with.

In our first thorascopic work we used Jacobeus' thoracoscope, but we prefer for general use Kremer's.

In Jacobeus' method galvano-cautery is used for the severance of adhesions. This is found to be less efficient in controlling bleeding than the diathermy current. Hence recent modifications use the diathermy current for the coagulation and for cutting. There is still some controversy as to whether diathermy or galvano-cautery should be used. We have used both methods in our work and we are of opinion that a thorascopic outfit should have both available. There are certain adhesions, especially the thin string-like adhesions, where the galvano-cautery is the better. On the other hand, some broad adhesions containing blood vessels require first coagulation by diathermy.

For both the galvano-cautery and the diathermy it is useful to have different types of operating cautery electrodes. Kremer's outfit is usually equipped with straight and curved galvano-cautery electrodes. We have found Matson's flexible and jointed operating diathermy electrodes a very useful addition to the equipment for reaching adhesions difficult to reach by inflexible instruments.

*Types of adhesions.*—The types of adhesions preventing the collapse of the lung vary a great deal. In some patients the whole or the major part of a lobe may be adherent to the chest wall, the adhesions being very extensive, and in others the space between the chest wall and the lung may be so narrow that no cauterization is possible. Some adhesions are broad and membranous; some are cone-shaped, containing a projection of lung tissue; some are purely fibrous and band- or string-like; and some are hour-glass shaped, the outer part consisting of fibrous tissue with or without blood vessels, and the medial part consisting mainly of lung tissue.

*Limitations of x-ray.*—A good x-ray film or fluoroscopic examination may show some or most of the adhesions present. But it must be understood that though the x-ray gives an idea of the adhesions, yet it does not always give a true picture. In actual thorascopic examinations we are likely to see more adhesions than are seen in the x-ray, and the nature of the adhesions may be quite different. Flat postero-anterior films may not show adhesions that go posteriorly and anteriorly, and some adhesions which look like strings turn out to be really

broad membranous adhesions. A thorascopic examination alone can reveal the nature and the number of adhesions.

*Indications for thorascopy and cauterization.*—Every case treated by artificial pneumothorax in which radiological examination after the first six or eight weeks shows the lung is collapsing imperfectly is a potential case for thorascopy and cauterization of adhesions.

Some of the adhesions which look incauterizable at the beginning may stretch and become cauterizable in course of time. Hence it may be advantageous in some cases to wait even three or four months before cauterization is attempted. But, on the other hand, it is dangerous in some cases to wait too long. The adhesions may give way under pressure tearing open the lung underneath, causing spontaneous pneumothorax and attendant complications. In others effusion may take place and the cauterization may be more difficult.

The presence of adhesions *per se* is not always an indication for operation. Some adhesions do not prevent a satisfactory collapse. Whether a collapse is satisfactory or not can be judged by the effect of the pneumothorax on the clinical symptoms such as temperature, cough, the quantity of sputum and the presence of bacilli and also by the blood findings.

On the other hand, in some cases, although the patient improves under pneumothorax treatment in spite of the presence of adhesions, cauterization may have to be done eventually, if the adhesion shows a tendency to pull out the lung too early.

The adhesions must also be reasonably suitable for cauterization. To judge this requires considerable experience, as it is specially important to be able to recognize what is seen through the thoracoscope and to be able to say whether particular adhesions contained blood vessels or lung tissue.

Finally, there must be sufficient pneumothorax space for the manipulation of the instrument.

*Contra-indications.*—There are few contra-indications for the division of adhesions. If effusion is present, it has to be aspirated before cauterization. But a recent acute onset of effusion is a definite contra-indication and thorascopic examination should be postponed till the acute stage is over, as interference inside the pleura at this stage is likely to cause severe reactions.

*Technique.*—For the technique the reader is referred to one of the various books on the surgery of the thorax as it would take too much space to give it in detail here.

*Complications during operation.*—Serious bleeding may take place during the cauterization of the adhesions. In our experience adhesions that go towards the anterior part, *i.e.*,



towards the sternum, are more likely to bleed than those going laterally or posteriorly.

In our series we have had three cases of severe bleeding, but none of them were fatal. Two of these bleedings occurred when we used galvano-cautery before we had the diathermy outfit. In one of these it was possible to stop the bleeding by coagulation with galvano-cautery at dull-red heat. In the other, this procedure did not materially lessen the bleeding which stopped by natural coagulation after some time; about 300 c.cm. of blood were aspirated from the pleural cavity 48 hours after the operation. The patient made an uneventful recovery and was discharged 'much improved', free from bacilli.

The third case of severe bleeding occurred while using the diathermy outfit, but the bleeding was controlled immediately by touching the parietal end of the adhesion with the coagulating electrode. There have been 15 instances of mild oozing which was controlled easily by coagulation either by galvano-cautery or by diathermy. In our experience diathermy is more certain of stopping the bleeding than galvano-cautery.

Another complication that may occur during the operation is too deep coagulation, and if this extends into the lung tissue it may later cause necrosis and pleuro-pulmonary fistula. Due care in coagulation can obviate this, and in our series no such complication occurred.

If cauterization is attempted close to the mediastinum, sudden death may be caused by touching the vagus nerve; or injury by heat or by electric current may be done to the mediastinal vessels. In one of our cases the mere touching of an adhesion near the mediastinum, even without switching on the current, caused severe shock and the attempt had to be given up.

Cauterization too close to the dome of the pleura may cause injury to the sub-clavian vessels.

Another complication is that bleeding may take place from the site of the trocar puncture in the chest wall.

*Complications after the operation.*—Secondary bleeding may in some cases take place either from the ends of cauterized adhesions which showed no tendency to bleed at the time of cauterization or from the puncture wounds in the chest wall where the instruments were introduced. We had a secondary bleeding in one of our cases. On the third day after the operation the patient was found to be very anæmic and slightly breathless—internal bleeding was suspected and a diagnostic puncture revealed the presence of blood in the pleural cavity and 600 c.cm. of bloody fluid were aspirated. The patient got better without any other complication and we are not sure whether the bleeding came from the adhesion or from the puncture wound. The

adhesion that was cauterized in this case was a simple one and a thorough search was made for any bleeding points after the cauterization, which we do as a routine in every case, and there was no sign of bleeding whatever from the cut ends of the adhesions. The bleeding probably took place from one of the punctures in the chest wall.

The most common complication after operation is subcutaneous or subfascial emphysema. The air escapes from the pleural cavity along the track of the trocar and canula, and if the patient coughs after the operation it may spread more and more under the skin during the first 24 hours. The emphysema may extend up to the face, sometimes causing pressure on the neck and difficulty in swallowing; it may extend down to the legs. This complication has never been fatal, but it causes slight discomfort for the first 24 or 36 hours after the operation. The administration of morphia after operation to reduce excessive cough may prevent it.

Effusion may occur after thoracoscopy, but it is difficult to judge how far this is due to the operation as effusion is a very common complication in ordinary pneumothorax treatment. Of 40 cases later reviewed, three had an effusion before the thoracoscopy; in the remaining 37 effusion appeared in 19 within three months, the effusion in a number being only very small in amount. This gives a percentage of 51.2, almost the same as the general percentage for effusion in pneumothorax treated patients.

Usually the effusion appearing after thoracoscopy is serous, but it is possible for infection to be introduced by unsterile technique and by injury to the lung during operation. However in our series of cases there was no instance of infection.

*Results in patients operated on in U. M. T. Sanatorium.*—Since May 1932 thoracoscopic examinations and cauterization were attempted in 52 patients. In a few the cauterization was done in more than one stage. In all, 64 thoracoscopic examinations were made. The number of adhesions seen in the 52 patients was 178, but not all of them were cauterizable.

In four of the patients no cauterization could be done; in eight patients the period after operation is less than a month and they are therefore omitted; and so 40 patients are left for consideration in the following statistics:—

Among these 40, only in 10 could all the adhesions be cauterized. Collapse of the lung was increased in all these 10 after the operation; five of them were 'much improved' and two 'improved'. Tubercle bacilli were present in the sputum in all the 10 at the time of the operation, and disappeared after operation in six.

PLATE VIII

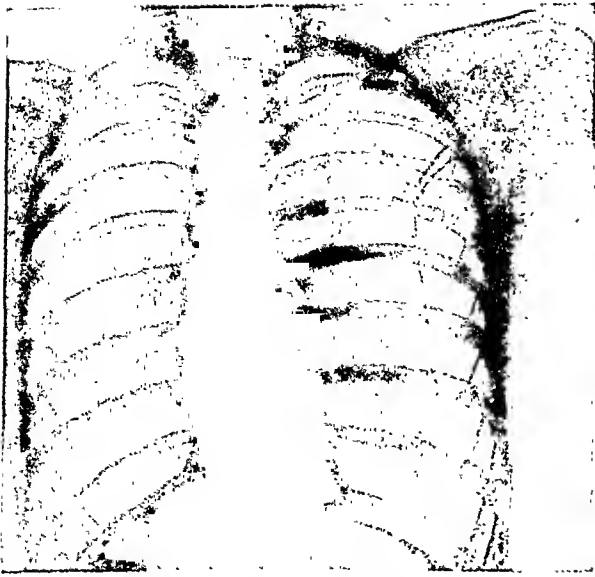


Fig. 1.—Mr. S. P. Before cauterization. Big cavity held open by adhesions.



Fig. 2.—Mr. S. P. Same patient as figure 1, after cauterization—cavity collapsed.

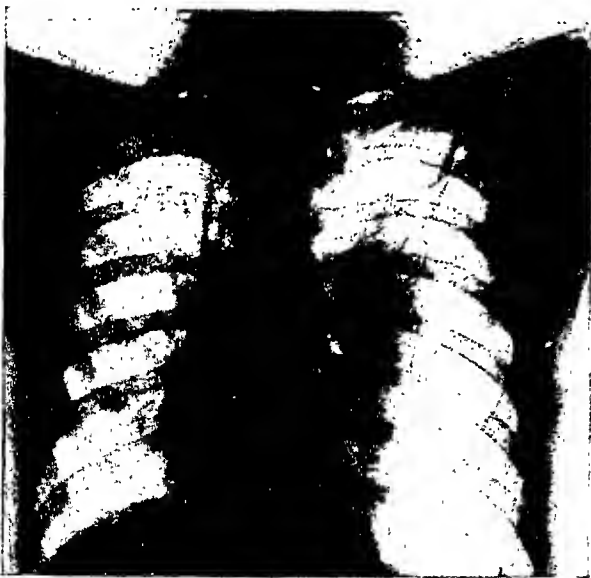


Fig. 3.—Mr. K. S. Before cauterization—adhesion preventing collapse of upper lobe.



Fig. 4.—Same as figure 3, after cauterization—collapse of lung good.

PLATE IX



Fig. 5.—Mr. A. Before cauterization.



Fig. 6.—Same as figure 5, after cauterization.

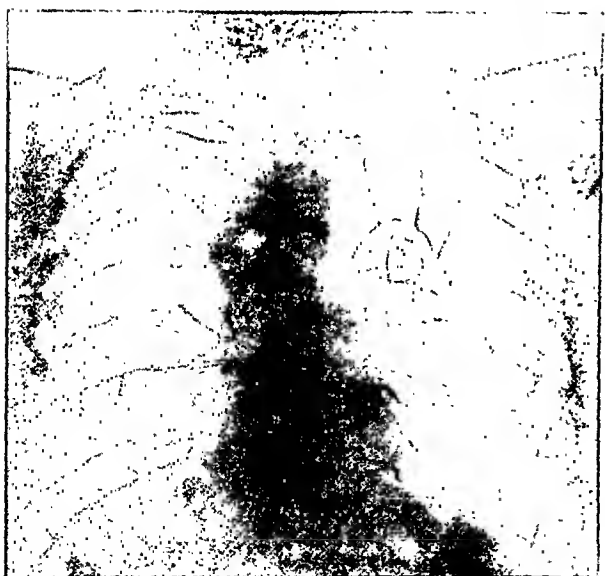


Fig. 7.—Mr. K. Before cauterization. Several adhesions keeping cavities uncollapsed.

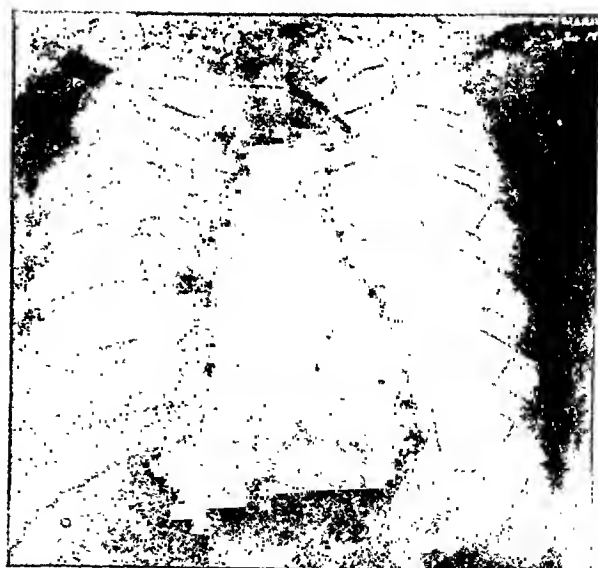


Fig. 8.—Same as figure 7, after cauterization—good collapse.

In the remaining 30 patients, all adhesions that were seen could not be cauterized, but one or more adhesions were cauterized in every case. As a result of the operation, the collapse of the lung was increased in all 30. Twelve patients were 'much improved' and nine 'improved', making a total of 21 or 70 per cent positive results. Tubercle bacilli were present in all the 30 patients in this group at the time of the operation, and they disappeared from the sputum in 14 or 46.7 per cent after the operation.

TABLE I  
*Results of treatment*

Number of patients	Much improved	Improved	Stationary	Worse
All adhesions cauterized				
10	5	2	2	1
One or more adhesions cauterized (but not all)				
30	12	9	2	7
TOTAL 40	17	11	4	8

Positive results 28 out of 40.

TABLE II  
*Disappearance of tubercle bacilli*

Number of patients	+ T B before cauterization	- T B after cauterization
All adhesions cauterized		
10	10	6
One or more adhesions cauterized (but not all)		
30	30	14
TOTAL 40	40	20

Judged from the point of view of general improvement and from the point of view of disappearance of tubercle bacilli from the sputum, these results are encouraging and give an idea of the scope of thoracoscopy and cauterization in improving the results of artificial pneumothorax treatment in pulmonary tuberculosis.

The results of the cauterization of adhesions in four individual cases are shown in figures 1 to 8 in plates VIII and IX.

## THE APPLICABILITY OF PHRENIC EVULSION IN PULMONARY TUBERCULOSIS AT THE OUT-PATIENTS' DEPARTMENT OF A CITY HOSPITAL

By A. C. UKIL, M.B., M.S.P.E. (Paris), F.S.M.F., F.N.I.  
P. CHATTERJEE, M.B., F.R.C.S. (Edin.)  
and

K. N. DE, B.Sc., M.B.

(From the Chest Department, Medical College Hospitals, Calcutta)

### Introduction

WITH an annual mortality of 3,000 from pulmonary tuberculosis in Calcutta and a provision of approximately only 200 beds for the tuberculous in the city and suburbs of Calcutta, we were faced with the problem of rendering aid to 1,500 to 2,000 cases of pulmonary tuberculosis in this department every year. The Medical College Hospitals have only 24 beds for the treatment of pulmonary tuberculosis which were very frequently occupied with urgent cases needing hospitalization.

Being anxious to bring surgical aid to the treatment of pulmonary tuberculosis, we managed to secure the temporary beds in the emergency section of the hospital where a stay of 48 hours was allowed to each patient after either primary artificial pneumothorax (A P), phrenic evulsion or gas replacement of pleural effusion. Although handicapped in many ways, we were able to deal with 164 cases of primary A P, 2,252 A P refills, 41 cases of phrenic evulsion and 40 cases of gas replacement of pleural effusion, besides numerous cases of minor surgical procedures, in the year 1935. The number of cases is increasing so steadily that we find it difficult to deal effectively with all cases in the absence of a larger hospital accommodation. For example, out of 446 cases found suitable for admission in the indoor tuberculosis wards of this hospital only 49 cases could be admitted. Out of 143 cases which were referred to the various sanatoria, only 10 could secure admission. Besides these, it may be pointed out that 52.7 per cent of the patients seeking our aid for the first time were in stage III of the Turban-Gerhardt classification, i.e., fairly advanced cases.

Under the circumstances, we were obliged to perform phrenic evulsion in the following types of cases:—

### 1. PRIMARY

#### (a) In unilateral cases

- (i) Where artificial pneumothorax had failed.
- (ii) In basal lesions.
- (iii) In cases with dragging pleuro-pericardial adhesions on the left side.
- (iv) In fibroid cases with considerable displacement of the mediastinum and accompanying dyspnoea.

- (v) In cases of hæmoptysis where A P has failed and where a thoracoplasty is contra-indicated.
- (vi) In cases of dry bronchiectasis with recurrent small hæmoptysis.
- (vii) In some cases of non-productive cough with diaphragmatic pleurisy.
- (viii) In early bronchiectasis and abscess of lung in the lower lobe before induration has set in.
- (ix) In tuberculous empyema as a preliminary procedure to thoracoplasty.
- (x) When concluding pneumothorax treatment in cases where re-expansion is tardy.

(b) *In bilateral cases*

Where artificial pneumothorax was not considered to be a judicious procedure owing to more or less extensive disease, but where the reduction of lung volume and movement on the more actively diseased side was deemed likely to reduce the absorption of tuberculo-toxin and to bring about a certain degree of relaxation of pulmonary traction sufficiently well to turn the scale towards improvement.

In some cases, phrenic evulsion was done on the side contralateral to that undergoing artificial pneumothorax.

## 2. SECONDARY

Where the operation was done as a supplementary procedure to artificial pneumothorax, especially in cases showing adhesions interfering with effective collapse and in some cases with peri-hilar cavities where pneumothorax alone was not sufficient to bring about an effective shrinkage of cavities owing to the continuity of the lesion to the resistant root of the lung. It has also been done in some cases before concluding artificial pneumothorax, especially in cases where a thick pleura interfered with re-expansion of the lung. In some of the latter, compressive oleothorax was done as a final procedure where the patient could not stay in town or where the lung tried to expand, while still showing a certain amount of activity in the affected area of the lung.

In a few cases with upper lobe lesions, scalenotomy was also performed in addition to phrenic evulsion.

*A few points about the operation*

We do not propose to describe the whole technique of the operation, but a few points about it may not be out of place here. The operation itself is simple and can be performed easily under local anæsthesia, except in young children in whom we have used evipan-sodium injections (intravenous) with success.

The researches of Felix and Goetze (1922) in Sauerbruch's clinic showed that simple division of the nerve was inadequate, as in 20 to 30 per cent of cases an important accessory branch joined the nerve below the usual level of section. There are several accessory branches but

the most common runs with the nerve to the subclavius and 3 cm. lateral to the phrenic, and has to be divided if the diaphragm is to be truly paralysed. This nerve arises from the fifth cervical nerve in the neck, enters the thorax in front of the subclavian vein and joins the main cord immediately below the sterno-clavicular articulation. At least 4 to 5 inches of the phrenic nerve should, therefore, be evulsed to make one feel reasonably certain that connections with the accessory phrenic nerve have been broken.

During the dissection of the nerve no pain is experienced by the patient. Clamping before division and traction on the nerve causes pain. The intensity of the pain is variable and, we believe, depends on two factors, (1) the amount of adhesions to be torn through and (2) the temperament of the patient. It is, however, by no means unbearable. During traction, there is always an acceleration of the heart beat.

The dissection became more difficult in our series when the pad of fat overlying the scalenus anticus muscle was excessive or where big veins or adherent enlarged lymphatic glands and lymphatics had to be dissected out.

The situation of the nerve is by no means constant. Usually it is situated on the scalenus anticus muscle and runs across its middle, downwards and inwards. This position may vary and the nerve may run along the inner edge of the muscle, at times covered by the sheath of the carotid artery or along its outer edge. In our series, the nerve was seen to run along the inner margin in 40 and along the outer border in 22 instances. The difficulties in finding the nerve, however, are more when it arises from the brachial plexus or arises from a common trunk with the nerve to the subclavius, i.e., when they arise from behind the scalenus anticus. In this series, the nerve was found to arise in 5 cases from the brachial plexus and in 2 cases from the common trunk with the nerve to the subclavius.

It is not always easy to take out the whole nerve. The size of the nerve varies considerably and, at times, is so thin that it cannot stand the amount of traction necessary to pull out the whole length. Chronic inflammation around the nerve may interfere with its elasticity and make it friable. If the nerve is bound down by dense adhesions not only does the patient complain of pain but it has a chance of breaking above the level of adhesion. During traction, slight oozing of blood occurs around the nerve at the inlet of the thorax. If the oozing is more than usual and blood is seen to well up it has become necessary at times to cut the nerve at the lowest point exposed.

*Complications*, such as division of the vagus, sympathetic and branches of the brachial plexuses and tearing of the subclavian vein or even of portions of the infected lung, are fortunately rare. In our series, there were

fortunately no untoward operative complications. In one case, there was a moderate amount of hæmoptysis which lasted for four days, while in a few there was a slight elevation of temperature which usually lasted for four or five days after the operation. In some cases of bilateral disease, the temperature lasted for a longer time, owing perhaps to an activation of foci in the other lung. In a few cases, dyspnoea disappearing in a few days after the operation was noticed. Mild gastric and intestinal disturbances, such as borborygmi and flatulence, nausea and vomiting, appeared in some cases but they disappeared in three to five days. These were commoner in left-sided cases. Some of the right-sided cases complained of pain in the lower part of the chest and right hypochondrium for a few days after operation.

#### *Rise of the diaphragm and length of nerve removed*

The rise of the diaphragm was not immediate. It takes months after the operation to reach its utmost limit. In the cases observed by us, the extent of average ascent was 3.75 cm. at the end of three weeks and 6.25 cm. at the end of two months. In two cases of removal of the whole nerve the hemidiaphragm was seen to reach up to the level of the third rib, yielding excellent results.

Many observers are of opinion that it is the positive intra-abdominal pressure which causes the elevation of the paralysed diaphragm and that, if the whole nerve is removed, the hemidiaphragm, by gradual atrophy of the muscle fibres, can be expected to rise high up. But this does not take place in cases where there are dense and extensive lateral adhesions. The degree of rise of the diaphragm is influenced by the nature of the lung changes and is greatest, other factors being equal, where the disease is of the chronic productive type with extensive fibrous-tissue changes.

The minimum rise in our series was noted to be 2.5 cm. and the maximum 9 cm. The average rise of diaphragm on the right side was found to be 3.5 cm., while that on the left side was 4 cm. It has been noticed that the rise of the diaphragm is higher and quicker on the left than on the right side. The following table gives some of the details:—

#### *Rise of the diaphragm in relation to the length of nerve removed*

Length of nerve removed	Number of cases	Average rise of diaphragm	
		Right	Left
Less than 12.5 cm. ..	110	3.5 cm.	4 cm.
More than 12.5 cm. but not the whole nerve.	60	4.5 cm.	5 cm.
The whole nerve ..	30	8.0 cm.	9 cm.

#### *A brief analysis of the cases*

We are dealing with 200 cases of phrenic evulsion, of which 198 were of pulmonary tuberculosis and two of lung abscess. The two cases of lung abscess had involvement of the lower lobe and both were benefited by the operation.

Primary phrenic evulsion, *i.e.*, where it was done as the sole surgical procedure, was done in 112 cases, and secondary phrenic evulsion, *i.e.*, where it was done as an adjunct to artificial pneumothorax or as a preliminary to thoracoplasty, was done in 86 cases. In one case of bilateral involvement, artificial pneumothorax was done on the left side and phrenic evulsion was done on the right with beneficial results. Of the total number of cases, four were operated on in 1932, 36 in 1933, 50 in 1934, 62 in 1935 and 48 in 1936, which means that all the cases have not yet passed the time test in assessing the results.

#### *Age and sex distribution*

Of the total number of cases 155 were males and 45 females. One of the female cases was pregnant at the time of operation which was followed by good after-results. The details of age and sex distribution are shown in the following table:—

Age	Male	Female
9-10 years	1	Nil
10-15 "	2	Nil
15-20 "	32	10
20-30 "	84	22
30-40 "	32	12
40-50 "	4	1
TOTAL ..	155	45

#### *Classification according to stage of disease*

According to Turban-Gerhardt classification, 18 cases were in stage II and 180 cases in stage III at the time of operation. None of the cases were in state I.

#### *Localization of lesion*

The following table shows the extent of lung involvement on both sides according to regions:—

Extent of involvement	SITE OF DISEASE		TOTAL
	Right lung	Left lung	
Chiefly limited to the upper zone.	58	22	80
Limited to the middle zone.	7	3	10
Limited to the lower zone.	10	4	14
Bilateral disease with more extensive lesion on the side indicated.	57	37	94
TOTAL ..	132	66	198



It will be noticed that, in the present series of cases, lesions on the right side were twice as frequent as those on the left side. Of the total number of cases, 112 showed the presence of single or multiple cavities (usually thin-walled) distributed as follows:—

In the lower zone	..	10 cases.
" " middle "	..	38 "
" " upper "	..	64 "

#### EFFECTS OF THE OPERATION ON THE DISEASE PROCESS

1. *On cough and expectoration.*—If cough is due to diaphragmatic irritation and expectoration is prevented by a tonic contraction of the diaphragm, the cough is relieved and expectoration facilitated by phrenic evulsion. Expectoration is gradually diminished along with a clinical improvement of the case. The sputum was markedly diminished, after the operation, in 76 and moderately diminished in 32 of our cases; the remainder showing no effect. This information, in outdoor cases, had naturally to be gathered from the statements of the patients and hence we do not consider it as of unimpeachable accuracy.

2. *On tubercle bacilli (TB) in sputum.*—Out of 198 cases, 178 had TB-positive sputum at the time of operation. The 20 negative-sputum cases never became positive during the period of observation. Of the 178 positive-sputum cases, 98 (or 55 per cent) became negative as a result of phrenic evulsion, while 80 still remained positive.

3. *On cavities.*—Cavities may be thin-walled, thick-walled or moth-eaten. It is well known now that thin-walled cavities are a predominant feature of subacute or chronic pulmonary tuberculosis in this country owing to comparative scarcity of urban and industrial areas and a consequent low degree of tuberculization of the population as compared with highly industrialized and urbanized countries in the West. A majority of our cases had thin-walled cavities.

Cavities could be demarcated in 112 cases and their localization was as follows:—

Localization	Number of cases	No. showing shrinkage and fibrosis	Percentage
Upper zone	64	54	84.3
Middle "	38	36	94.7
Lower "	10	10	100.0

A complete obliteration of cavities was noticed in 42 cases (= 37 per cent). Cavities were appreciably shrunk in 58 cases (= 52 per cent), and no results were discernible in 12 cases (= 11 per cent).

As will appear from the above table, of 64 upper lobe cavity cases, 54 showed diminution in size and fibrosis, showing that upper-lobe

lesions need not constitute a contra-indication to phrenic evulsion. O'Brien's (1930) (*Journ. Amer. Med. Assoc.*, xcv, p. 650) figures in this connection will be found interesting. Among 311 cases of cavity in the upper lung field in his series 46.6 per cent were closed, in 40 cases of cavity in the middle lung field 62 per cent were closed and in 27 cases with cavity in the lower lung field 80 per cent were closed.

4. *Other effects.*—It has already been mentioned that symptoms such as cough and expectoration are greatly relieved. Symptoms such as pain or dragging due to diaphragmatic adhesions are also greatly relieved. Owing to the diminution or obliteration of cavities and of the lymph and venous stasis, there is diminished absorption of tubercle toxins and a consequent reduction of pyrexia and improvement in general health. The sedimentation rate of blood is also correspondingly lessened.

It should be well understood that phrenic evulsion is but an accessory to general sanatorium regime, coupled or not with other measures such as gold therapy, artificial pneumothorax, etc. We have employed it in those cases where from the nature of lung changes or from the social status and general condition of the patient we desired to overcome those mechanical changes which appeared to us to act as a hindrance or barrier to healing. Those patients who listened strictly to our instructions regarding regulation of rest and exercise naturally did better than the foolish ones who took the law into their own hands and thought that they could disregard our instructions after the operation has been done.

#### Results in relation to the rise of the dome of the diaphragm

The degree of improvement depends, to some extent, on the length of the nerve removed—the greater the length of nerve removed, the better the improvement, as will appear from the following table in our series:—

Length of nerve removed	Number of cases	Clinically improved	Percentage
Less than 12.5 cm.	110	50	45.4
More than 12.5 cm. but not the whole nerve.	60	45	75.0
The whole nerve	30	25	83.3

Morrison Davies (1933) (*Pulmonary Tuberculosis*, p. 323) is of the opinion that the diminution in the volume of the lung which follows as a result of hemidiaphragmatic paralysis is manifested in some cases as strikingly on the apical as on the basal lesions. There is some divergence of opinion on this point but our findings lend support to his views. Unless the root of the lung is firmly fixed by

adhesions, the movements of the diaphragm affect the apex almost as much as the base. The collapse of the lung, consequent on the paralysis of the hemidiaphragm, is probably equally distributed throughout the whole lung, although the effects are more noticeable in those parts which show more proliferative lesions or where there are basal adhesions.

The results given below in relation to localization of lesions in our series will lend support to the views of Morrison Davies and others :—

We cite below three typical cases for illustration :—

*Case I.*—A. H., Mohammedan, male, aged 30 years, tailor, came under our observation on 29th June, 1932.

*History.*—Wife died of pulmonary tuberculosis. He has been suffering from cough for five months and fever and wasting for one month before he sought treatment here.

*Physical examination.*—Comparative loss of resonance and medium crepitant râles over both subclavicular areas, but more extensive over the left. Skiagraph taken on 18th July, 1932, showed semi-productive infiltration and cavitation of both upper lobes in the

#### Results in relation to localization of lesions

Extent of involvement	Arrested	Much improved	Improved	Stationary	Worse	Died	Total	Percentage of positive results
Limited to upper zone	1	1	20	27	14	17	80	27.5
Limited to middle zone	0	2	0	0	2	6	10	20.0
Limited to lower zone	1	8	4	1	2	0	16	81.2
Bilateral disease, with more extensive disease on the side operated upon.	0	11	72	0	2	9	94	88.2
<b>TOTAL ..</b>	<b>2</b>	<b>22</b>	<b>96</b>	<b>28</b>	<b>20</b>	<b>32</b>	<b>200</b>	<b>..</b>

We should like to state that all the operations have not been done in the same year. We introduced the operation in our out-patient's clinic in the year 1932. As will appear from the following table, as many as 110 cases were operated on during the last two years. Many of these cases have swelled the figures under the category of 'improved cases', especially in the bilateral ones. With further 'time control' some of them will shift their categories to the better or worse side. The assessment of results according to the period of observation will be seen better in the following table :—

sub-clavicular area, but more active on the left side (plate X). There were no extra-pulmonary complications. Sputum was TB-positive (in large numbers).

*Treatment.*—Artificial pneumothorax was tried on the left side but failed. Left phrenic evulsion was, therefore, done on 12th August, 1932, 20 cm. of the nerve being removed. Sputum has remained TB-negative since 5th December, 1932. He has gained 32 lb. in weight since then and has remained symptom-free. Is doing full work (tailoring) for the last two years. Has had two courses of gold therapy (intramuscular solganal B. oleosum).

*Case II.*—M. M. R., Hindu, male, aged 26 years.

*Previous history.*—Pleurisy left, six years ago.

Hæmoptysis in streaks, a year ago.

Year in which operation was done	1932	1933	1934	1935	1936	TOTAL
Period of observation with results ..	5 years	4 years	3 years	2 years	1 year	..
Arrested .. ..	1	1	0	0	0	2
Much improved .. ..	1	8	6	5	2	22
Improved .. ..	1	4	28	35	28	96
Stationary .. ..	0	3	8	5	10	28
Worse .. ..	0	8	5	5	4	20
Died .. ..	1	12	3	12	4	32
<b>TOTAL ..</b>	<b>4</b>	<b>36</b>	<b>50</b>	<b>62</b>	<b>48</b>	<b>200</b>

It will be seen that 'positive' results (i.e., improvement) have been obtained in 60 per cent of cases. If we leave aside the cases for 1935 and 1936, it will be seen that 50 out of 90 cases (or 55 per cent) showed improvement and are still living. If we take the cases operated on during the first three years, we shall find that at least 20 per cent of the persons operated on have regained their working capacity.

*Complaints.*—Cough, with half an ounce of expectoration in 24 hours—for four months, a low fever for two months and a moderate amount of wasting.

*Physical examination.*—Comparative loss of resonance over the left upper lobe of lung. Cavernous breathing and medium crepitant râles over the same area. Deficient air entry in right upper lobe. Sputum showed a large number of TB in smear. Skiagraph showed extensive semi-productive infiltration with a cavity in the middle zone (plate X).

*Treatment adopted.*—Artificial pneumothorax having failed on the left side, phrenic evulsion was done on 26th June, 1936, and the entire nerve (31 cm.) was removed. Since then the patient has gained 36½ lb. in weight within six months, the sputum has remained TB-negative since 16th July, 1936, and the case has remained symptom-free. A course of solganal B. oleosum has also been given. There is no extra-pulmonary complication.

*Case III.*—Dr. D. M., Hindu, male, aged 40 years, medical practitioner, Calcutta.

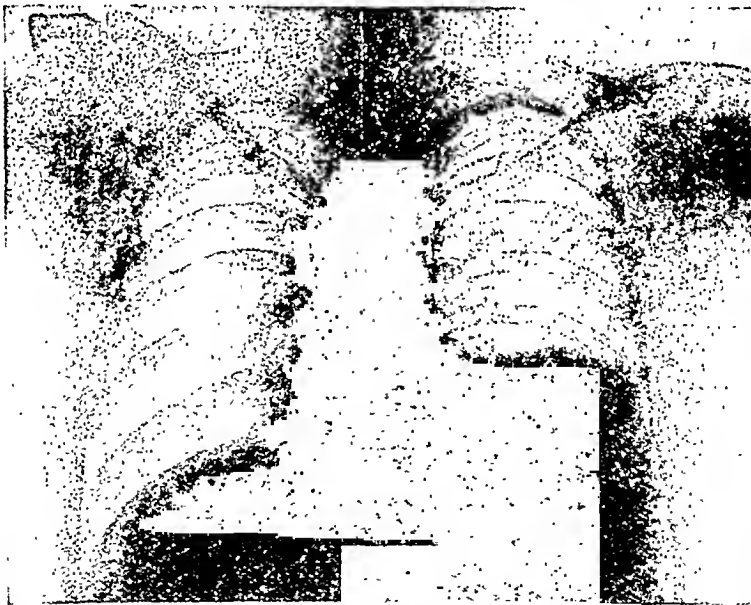
*History.*—Diabetes and high blood-sugar detected in 1928. Came to the senior author on 7th January, 1936, for progressive loss of weight for two years, slight cough, repeated moderate hæmoptysis and the fever off and on since 1934.

*Physical examination.*—The patient was running a slight temperature at the time and the maximum daily pulse rate was 100 per min. Expectoration—four tea-spoonfuls daily, containing a fair number of tubercle bacilli. Chest examination showed some loss of resonance, increase of vocal fremitus and presence of occasional râles. Skiagraph of the chest showed a 'circular focus' in the medial portion of the right upper lobe and semi-productive infiltration of the whole of the left lung with a good-size cavity in the left sub-apical area.

*Treatment undertaken.*—Glycosuria was controlled with insulin therapy. Artificial pneumothorax was tried on the left side but failed. Left phrenic evulsion was done on 27th January, 1936, six inches of the nerve being removed. The temperature came down to normal a fortnight after the operation and he has been fever-free since. He has had two courses of solganal B. oleosum. He was examined last on 20th February, 1937. He has gained 2 stones 2 lb. since operation and has a pulse rate of 70 to 76 per minute. The left hemidiaphragm has risen to 3rd rib above, the infiltrations are fibrosing well, the old cavity has nearly been obliterated and the sputum has remained negative since June 1936 (see figure below).

areas, in whom localization of lesions in the lung is rather fragmentary owing to generally marked hypersensitiveness to tuberculo-toxin, as has already been stated.

Barely 10 per cent of the cases are found to be suitable for artificial pneumothorax therapy. Among them also, various degrees of ineffective compression of lung are obtained owing either to the presence of adhesions or to the proliferative nature of the changes. Among the latter, where cauterization of adhesions is not possible and where thoracoplasty is not indicated or possible, we have to choose our cases for phrenicectomy. Besides these, we have to think of this procedure where artificial pneumothorax has failed or where, from the extensive distribution of lesions, no other surgical procedure is applicable. Where pneumothorax is practicable and effective, the question of phrenic evulsion does not arise, nor does it arise when there are multiple and thick-walled cavities or when the lesions are acute and exudative. Whether phrenic evulsion is the sole surgical procedure or is used as an adjunct to pneumothorax, the cases have got to be properly chosen. The fact that it is a simple operation which is not likely to give rise to shock or serious reaction, that it has to be done only once, that it brings about the same sclerotic changes in involved lung tissues as in pneumothorax, that it can be performed on patients who are in a grave condition, and that it is free from the risks of reaction and



*Case III.*—Phrenic evulsion in a diabetic, resorbing infiltrations and obliterating the vomica in the left upper lobe.

#### Discussion

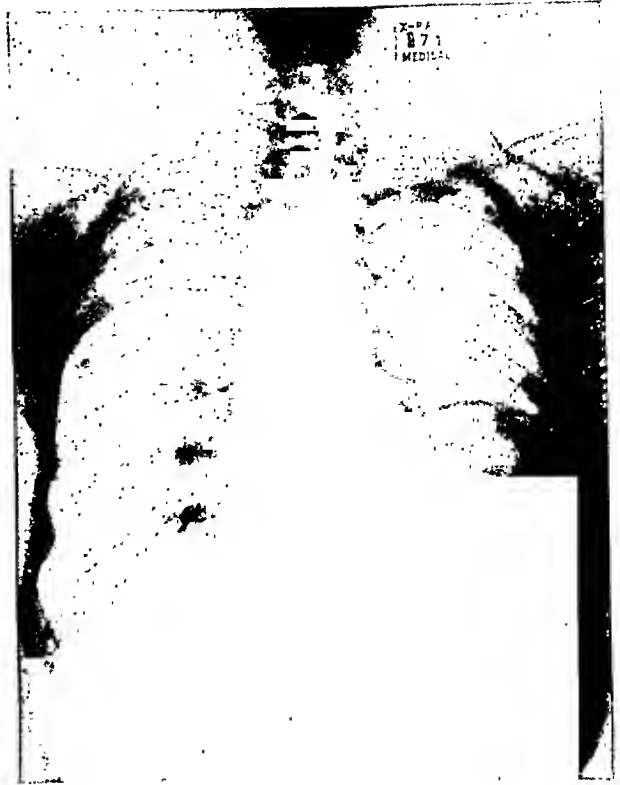
We have already stated that over 50 per cent of the patients who seek the aid of this section of the hospital are found to be in a fairly advanced stage of the disease. A fair number of patients comes from rural and semi-rural

pleural effusion common in pneumothorax, no doubt makes a great appeal for its application in suitable cases. The paralysis of the hemidiaphragm gives an additional amount of rest

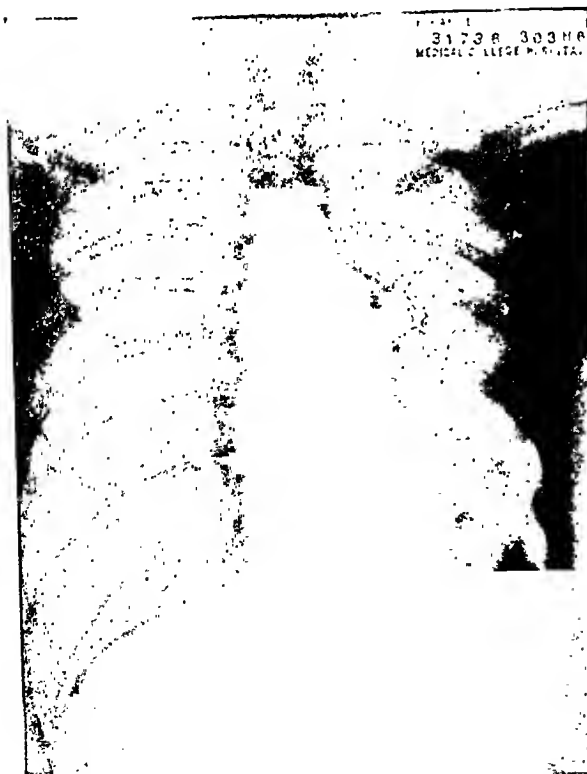
(Continued at foot of opposite page)



Case I. Fig. 1.—Lesions when patient first came under observation (18th July, 1932).



Case I. Fig. 2.—Same patient 3½ years after left phrenic evulsion. It will be seen that after the correction of the toxic imbalance by the left-sided operation, the lesions on both sides began to improve.

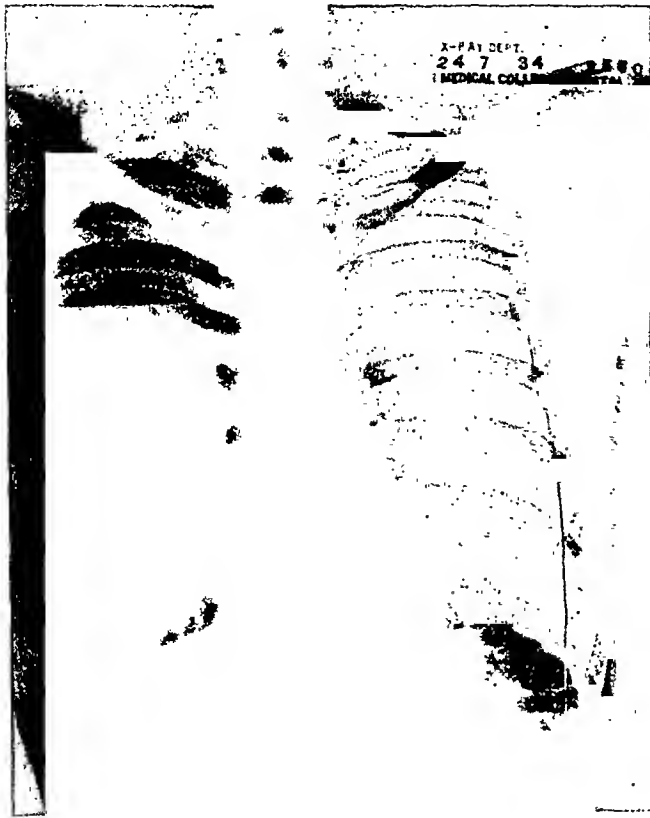


Case II. Fig. 1.—Lesions one month after left phrenic evulsion.

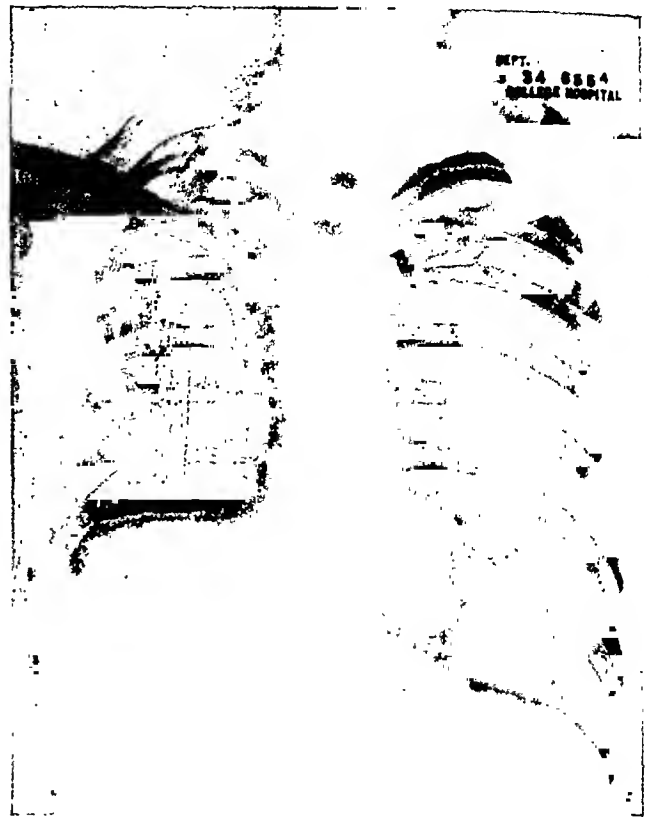


Case II. Fig. 2.—Same case six months after operation. The infiltration in the left upper and middle zones has considerably cleared up and the cavity in the middle zone practically closed.

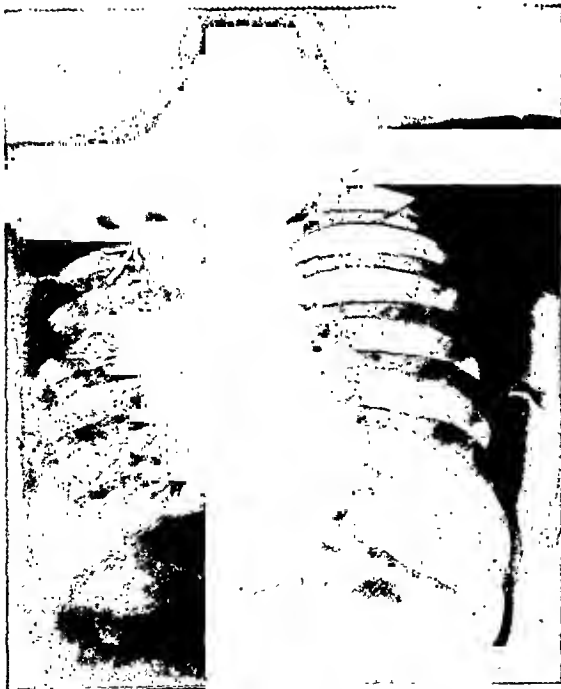
PLATE XI



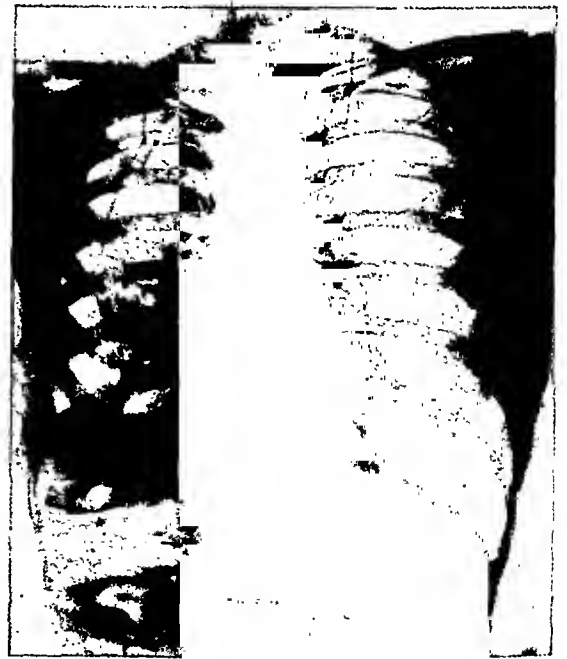
Case 1.—Replacement oleothorax.  
Dated 24th July, 1934.



Case 2.—Compressive oleothorax.  
Dated 22nd November, 1934.



Case 3. Fig. 1.—Dated 15th June, 1933. Exudative infiltration in right upper lobe and peri-hilar region. Cavity in right sub-apical area. Sputum TB-positive.



Case 3. Fig. 2.—Dated 14th December, 1934. After pleural effusion has cleared up and before phrenic evulsion. Infiltrations much harder, upper lobe cavity nearly obliterated.

## OLEOTHORAX IN THE TREATMENT OF PLEURO-PULMONARY TUBERCULOSIS

By A. C. UKIL, M.B., M.S.P.E. (Paris), F.S.M.F., F.N.J.  
and

K. N. DE, B.Sc., M.B.

(From the Department of Chest Diseases, Medical College Hospitals, Calcutta)

By the term 'oleothorax' is meant the introduction of massive quantities of oil (plain or antiseptic) into the pleural cavity for therapeutic purposes. This branch of phthisiology is indebted to Bernou (1922) for introducing and developing the method. A large amount of work has now been done on the subject in France, Switzerland, Germany, England and other countries. The method, however, requires a careful judgment in the selection of cases, a far greater technical skill in application and a closer observation of cases than pneumothorax therapy. Hence, like all new methods of therapy, it has been subjected to some divergence of opinion among different workers.

A case of uninterrupted and successful pneumothorax treatment requires a period of three years or more to bring about healing of the lesion. Unfortunately certain difficulties and complications are encountered during

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to the affected lung by diminishing the respiratory excursion, by increased compression and by relaxation of lung when cavities are held open by adhesions to chest wall.

In apical lesions, we have now begun to perform scalenotomy, in combination with phrenicectomy, in suitable cases but are not yet in a position to assess its results. As the scalene muscles are accessory muscles of respiration, the operation is expected to relax the apical region of the lung and to reduce the size of cavities.

Phrenicectomy has a definite place in the treatment of pulmonary tuberculosis, particularly in the type of case we had to deal with. We do not subscribe to the view that phrenic evulsion should be done as an adjuvant in every case of pneumothorax where there is cavitation. It is better to judge each case on its own merits. Remembering that 91 per cent of our cases were in stage III and the remainder (9 per cent) in stage II of the disease before the operation and that, in the absence of sanatorium or hospital beds, we could offer them no other treatment, we have reason to be gratified to find that 55 per cent of the patients became TB-negative in the sputum and that 60 per cent of the total showed 'positive' results. Even extra-pulmonary lesions, like laryngeal tuberculosis, have been seen to improve after the control of the TB in the sputum brought about by phrenic evulsion.

the course of treatment. The introduction of aseptic or antiseptic oils into the pleural cavity has been devised to mitigate or solve some of them. It is in no sense a substitute for pneumothorax treatment.

For example, in some cases of pneumothorax, especially where selective collapse has been obtained, the healthy part of the lung may tend to expand too quickly and form 'riding' adhesions with parietal pleural membrane and gradually obliterate the pneumothorax space. In these cases, the introduction of aseptic oil into the pleural cavity checks the re-expansion and consequent adhesions by virtue of its slow absorption and weight and thus allows effective pneumothorax to be carried on. This is called *inhibition pneumothorax* (= *oleothorax anti-symphysaire* of French authors).

In some cases where a pleural effusion has occurred, the tendency to adhere becomes more marked and the pleura becomes thicker and more rigid. Air inflations are not always enough to maintain an effective collapse in such cases. In these cases, the introduction of oil into the pleural cavity lessens the permeability of the pleural membrane and secures a better compression of the affected area of the lung and, owing to its slow absorption, obviates the necessity of frequent refills. In certain cases with rigid-wall cavities, air insufflations are inadequate to effect a closure of the cavities. In some of these cases, the replacement of air by oil serves the purpose. This type of oleothorax is called *compression oleothorax*. In a smaller number of cases, the mediastinum shows insufficient rigidity and does not allow the introduction of enough air for pneumothorax without producing a mediastinal hernia. In these cases, the introduction of oil stimulates slight reactions and thickens the mediastinal pleura. In some cases a patient may be unable to continue the air insufflations at the required intervals. Here oleothorax may be substituted for pneumothorax very carefully. Oleothorax has sometimes been employed to close small transitory, intermittent or valve-type perforations, where the viscosity and pressure of the oil, aided by a thickening of the pleura at the mouth of the fistula, effect a closure of the opening. The addition of a small percentage of antiseptic serves to inhibit or relieve a complicating pyothorax later on. It is contra-indicated for pleuro-pulmonary fistulae with a large opening. In all the above types of cases, oleothorax exercises both a mechanical and rigidifying action.

By far the largest use of oleothorax is in the treatment of chronic tuberculous pleurisy, sero-fibrinous or purulent, which may occur primarily or in the course of pneumothorax treatment. It has been noted that 30 per cent of pulmonary tuberculosis cases give a previous history of pleurisy and that 80 per cent of chronic pleural effusion are of tuberculous



origin. In a series of 130 pleural effusions examined microscopically, by culture and animal inoculation, according to the technique described by us in a previous paper (Ukil and Thakurta, 1936), tubercle bacilli could be demonstrated in direct smear (without concentration) in 14 cases, by culture in 18 cases and by animal inoculation in 22 cases. If we exclude 28 materials from tuberculous empyema cases, 19 or 18.6 per cent serofibrous effusions showed tubercle bacilli. 78.5 per cent of the empyema cases showed tubercle bacilli on examination by one or more of these methods. Gloyne's (1913) figures with regard to serous effusions were much higher than in our series. He found tubercle bacilli by microscopic examination in 40 per cent of serous and in 71.43 per cent of purulent effusions. The discrepancy with regard to serous effusions is due to the fact that our figures relate to an examination of direct smears without any digestion and concentration method being used, whereas Gloyne used them besides making smears from the teased clot. It is well known that 40 to 50 per cent of pneumothorax cases develop fluid at some time or other during the course of treatment. The small effusions disappear in several weeks with diuretics and calcium chloride. In the larger effusions which have lasted for three or four months, the albumin content, specific gravity and cellular elements begin to increase and show a more frequent presence of tubercle bacilli. Aspiration and administration of diuretics answer the purpose in a fair number of cases. Where, however, the exudate fails to resorb owing to alteration in the permeability of the pleura, or shows symptoms of toxæmia and seriously affects the well-being of the patient, or where the fluid gradually becomes turbid and purulent owing to caseous tuberculous pleuritis or to pulmonary perforations, the question of replacement of the effusion by antiseptic oil has to be considered in order to disinfect the pleural cavity, to prevent re-formation of fluid and to maintain the pulmonary collapse, if necessary. Among 265 cases of artificial pneumothorax under the care of Dumarest and Brette (1929), pleural effusions occurred in 186 cases, 42 of which turned out to be purulent. In pneumothorax cases, complicated with such effusions, two questions have to be faced—(1) preventing obliteration of the pleural cavity, and (2) combating the intrapleural infection. In these cases, if we can stop re-formation of the exudate, we may be able to avoid the much more severe operation of thoracoplasty in unilateral cases. If the purulent exudates are allowed to pursue their natural course without treatment, a majority of the cases tends to end by perforation or amyloid changes. Duboff (1919) reported 20 cases in 1919, ten of which had ruptures either into the bronchus or through the chest wall, while a number of the rest

developed amyloid changes. In these cases, if we can stop re-formation of the exudate, we may be able not only to prevent these accidents but to avoid the much more severe operation of thoracoplasty (in unilateral cases). The addition of an antiseptic to the oil for oleothorax is a much more important question in these cases. This type of oleothorax is known as *disinfection oleothorax*.

To prevent these complications, various attempts have been made to find out an agent which would admit of easy application, would prevent pleural symphysis, would not cause undue irritation of the pleura or produce a systemic effect, would possess a bacteriolytic or bacteriostatic effect on the tubercle bacillus and even secondary organisms, and would preferably liquify the debris present in the exudate. As a base, two types of oil have been used, paraffin oil and olive oil of the highest degree of purity and neutral in reaction. An antiseptic may be added to them in various proportions to serve different purposes. As antiseptics, various substances have been tried, such as alepol, acriflavine, metaphen (4 nitro-anhydro-hydroxy-mercuri-ortho-cresol), iodipin and gomenol. We have almost exclusively used gomenol in our work. Gomenol (niaouli oil), a volatile oil obtained by distillation of the leaves of *Melaleuca viridiflora* growing abundantly in the region of Gomen in New Caledonia, has been more extensively used than any other agent. The toxicity and bactericidal properties of this oil and its vapour have been carefully studied by Clerc and others. It has been shown that gomenol possesses a marked influence in inhibiting the growth of many organisms, particularly of the acid-fast group, but is not so marked towards other organisms, except in high concentrations. Gomenol lessens the permeability of the pleura and thereby lessens the absorption of toxins from effusions and of air in pneumothorax. Dilutions are made in olive oil in strengths varying from 1 to 10 per cent according to the purpose for which it is employed. It is supplied by Laboratoire du Gomenol, 48, Rue des Petites-Ecuries, Paris, and the local agents in India are G. Loucatos, 15-A, Elphinstone Circle, Bombay. Rudman and Ellison (1932) consider metaphen-in-oil to be superior to gomenol in its bactericidal and liquifying properties and in reducing the specific gravity of pleural exudates.

Gomenol dissolves with difficulty in paraffin oil but does so with ease in olive oil. Paraffin oil is absorbed more slowly than olive oil. Olive oil is supposed to keep the pleura soft, while paraffin oil thickens it. Olive oil is saponified in contact with pus and leads to increased absorption, thereby exercising a nutritive value. It is more lethal to tubercle bacilli than liquid paraffin. Paraffin oil floats on the surface of the pleural effusion. Paraffin oil is sterilized by heating for 20 minutes at 160°C.

and olive oil at 105°C. for one and a half hours. Gomenol is usually mixed with paraffin oil in strengths varying from 0.5 to 2.0 per cent and with olive oil in strengths varying from 2 to 10 per cent and then allowed to stand for two to three weeks to allow the oils to be thoroughly mixed together. We have often used plain paraffin oil, without any antiseptics, in inhibition and compression oleothorax with good results.

#### *Inhibition and compression oleothorax*

In *inhibition oleothorax* a complete blockage is not necessary and hence a comparatively small amount of oil serves the purpose. In *compression oleothorax* a complete blockage is desirable. In cases where there are dense adhesions over a thin-walled cavity, oleothorax should be done with great caution, avoiding high pressures altogether, as it is dangerous to stretch the pleural cavity in the presence of adhesions. In these cases the object is to secure better compression where air insufflations have been unable to achieve sufficient collapse. In one of our cases it was necessary to replace pneumothorax by the introduction of oil, owing to the patient's inconvenience about air refills (case 1). Really speaking, this is not an example of compression pneumothorax; it might be called *replacement oleothorax*. We have used paraffin oil, instead of olive oil, in these cases, as it is less absorbable and because it thickens the pleura. We have successfully employed this, without the addition of an antiseptic (1 to 2 per cent gomenol) as has been advocated by some workers. But in case of laxity of the mediastinum we prefer to add a little antiseptic (1 to 2 per cent gomenol) in order to bring on pleural reaction with a view to stiffening the membrane. In these cases, small quantities should be introduced and the patient should be instructed to lie on the opposite side to allow the oil to bathe the mediastinum.

The technique of oil injections is the same as described below under disinfection oleothorax, i.e., the pleural sensibility is first tested with small doses at weekly intervals and, if no intolerance is observed, larger injections not exceeding a total of 250 c.cm. in the female and 350 to 400 c.cm. in the male are given, keeping the various difficulties and danger points in view, and not forgetting to release a corresponding volume of air with the help of the water manometer.

The patient is placed recumbent in the dorso-lateral position lying on the healthy side. A small cushion is placed under the axilla to bring about a bulging of the chest. The oil should be warmed and introduced, with strict aseptic precautions, at the highest point of bulging. The A P needle is introduced at the highest point of the air pocket and the air pressure gauged, from time to time, during the process.

A Diculafoy syringe with rubber connections is more convenient but the procedure can be managed with a 20-c.cm. syringe attached through rubber to an A P needle. Needles for the introduction of paraffin oil should have a bore of 1.0 mm. In this case, air, in units of 20 c.cm., may be withdrawn and the corresponding amount of oil introduced carefully. We have also employed 50-c.cm. and 100-c.cm. syringes for this purpose. The pressure of the oil can be determined by noting whether oil comes out of the opening of the needle. If it overflows, it indicates positive pressure; if it remains stationary at the mouth of the needle, the pressure may be considered as neutral; if it does not reach the mouth of the needle, the pressure is probably negative. The force necessary to push the piston down with the fingers also gives us an indication of the pressure.

The final pressure should either be neutral or slightly negative. Too high positive pressures are not advisable as they are likely to tear away adhesions and cause serious displacement of a mobile mediastinum or may bring about trouble if an effusion occurs. According to indications, the pneumothorax cavity is to be incompletely or completely filled up with oil, leaving a few cubic centimetres of lipiodol to facilitate periodical observations under the x-ray screen. A careful watch should be kept about the occurrence of effusions and the patient should be screened once a fortnight in the beginning. The paraffin oil floats on the top and the layer can be differentiated by careful examination under the x-ray screen. The pressure may be determined by putting in a needle once a month during the first three months and thereafter every three months. As a certain amount of oil (50 to 100 c.cm. of oil per month according to Fontaine) is absorbed, although the absorptive capacity of the pleura gradually decreases, oil replacement should be done when necessary. Puncturing at the most dependent part will enable us to see whether an effusion has occurred.

**Results.**—Out of 22 cases of oleothorax in our series, inhibition oleothorax was done in two, replacement oleothorax in one and compressive oleothorax in five. All these cases had a favourable termination, five being 'arrested' and three 'much improved'. Maston, Ray W. (1932), obtained, in a series of 50 cases, satisfactory results in 50 per cent of the cases. In 40 per cent of these, the treatment had to be abandoned owing to persistent exudate formation, and in another 10 per cent owing to the appearance of severe constitutional symptoms. In our series no such drawbacks were noticed.

We cite below one case of replacement oleothorax and two cases of compression oleothorax for illustration:—

**Case 1.**—R. J., a Hindu male, aged 20 years, came to us in December 1932 for fever, cough and emaciation lasting for three months. Sputum was tubercle

bacilli positive. On examination, the right upper lobe was seen to have exudative infiltration with small cavities.

*Treatment.*—Artificial pneumothorax was done on the right side but after some time effusion occurred. After aspiration of the serous fluid, the right lung was expanding too quickly and obliterative pleurisy was apprehended. At this time he wanted to go to his native village. We introduced 250 c.cm. of sterile paraffin oil into the pleural cavity and observed the case for a few weeks (plate XI). Finding that no further effusion had taken place, he was allowed to go home and to report himself back later on. He is now doing his usual work for one year without any symptom.

*Case 2.*—S. R. L., a Hindu male, aged 21 years, came under our care in July 1933 with a history of fever, cough and emaciation for one year, and periodical moderate hæmoptysis. The sputum was tubercle bacilli positive.

The whole of the right lung was involved with rather productive infiltration and three cavities in the upper and middle lobes with considerable retraction of the trachea. The left upper lobe also had an area of productive infiltration with a small vomica in the centre.

*Treatment.*—In view of the tracheal retraction and superficial position of the cavities, we performed phrenic evulsion on 29th July, 1933, when five inches of the nerve could be taken out. This had a beneficial effect, but to supplement it we tried to perform pneumothorax on account of the adhesions above; only a moderate-size air pocket could be created. Since this required frequent refills we decided to perform an oil blockage of the pocket with aseptic paraffin oil. This helped not only to render the sputum negative and to close the cavities, but also caused the disappearance of the lesions on the left side (plate XI).

*Case 3.*—A. F., a European female, aged 23 years, was diagnosed in June 1933 as a case of pulmonary tuberculosis with exudative infiltration in the right upper lobe and perihilar region and a cavity in the sub-apical area (plate XI, figure 1). Sputum was tubercle bacilli positive.

She underwent artificial pneumothorax treatment at K. E. Sanatorium at Bhowali for 18 months, where she had a course of solganal B. oleosum. Effusion occurred during pneumothorax treatment, the visceral pleura was thickened and adhesions formed at the right costo-phrenic angle (plate XI, figure 2). Tubercle bacilli disappeared from the sputum for some time but subsequently re-appeared, probably from the perihilar lesion, as by this time the cavity in the upper lobe appeared to have nearly closed and the infiltrations hardened.

*Treatment.*—Right phrenic evulsion was done in January 1935. By the 1st March, the diaphragm had risen by one inch (plate XII, figure 3). As the patient wanted to go away, compressive oleothorax was done with aseptic paraffin oil. The sputum became tubercle bacilli negative and the patient remained well since then.

#### *Disinfection oleothorax in pleural effusions*

In the acute stage of pleural effusion, the pleura being already acutely inflamed and irritable, oleothorax is not applicable for fear of further irritation of the pleural surface. If the liquid is serous or sero-fibrinous and if it continues to form and cause mediastinal displacement and dyspnoea, a simple aspiration, if necessary by gas replacement, serves the purpose. In a majority of cases, a single aspiration stops further effusion.

In some cases, the temperature remains high even after withdrawal of effusion of the above description and the fluid continues to re-form. The fluid gradually gets turbid and the patient loses ground. In other cases, a low degree of fever persists for weeks, although fluid may not

form so quickly as in the former case. In both these types of cases, the removal of fluid and its replacement by gomenolized oil of low strength stop further formation of fluid and reduce the toxæmia. This action is believed to be brought about by the diminished absorption of toxins owing to thickening of the pleural membranes and also to the dissolution of bacilli-laden tissues, floating in the fluid by the proteolytic ferments released by the dissolution of leucocytes. The improvement after oleothorax becomes evident by the disappearance of fever and the improvement of appetite and the general condition of the patient.

If, in some of the above cases, repeated aspirations are done without oleothorax, the character of the fluid gradually changes from turbid to puriform, so that finally a cold abscess in the pleura is produced. Tuberculous empyema (1) may complicate an artificial pneumothorax, or (2) a spontaneous pneumothorax, or (3) may be due to rupture or puncture of a subpleural focus, or to rupture or division of pleural adhesions, or, rarely, (4) may arise without any apparent tuberculous lesions of the lungs.

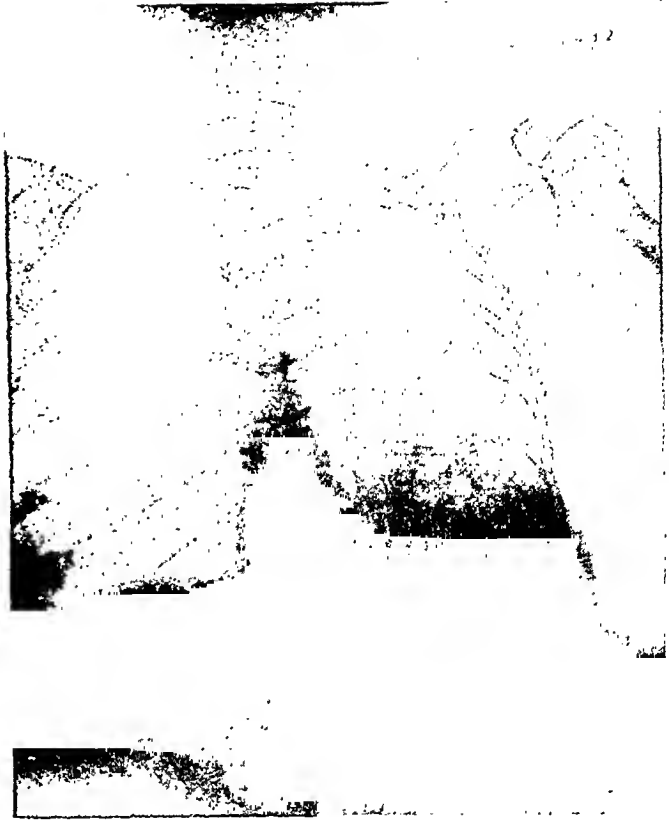
Clinically, a case may be slow in evolution and non-toxic, where the inflammatory process subsides and the temperature falls to normal after a few aspirations, or acute, toxic and virulent, which is normally associated with extensive involvement of the pleura with acute tubercles or with secondary infection, high fever of hectic type and profound toxæmia. In the former type of cases, oleothorax produces very good results. In the latter type, oleothorax does no harm and may spare him the necessity of a surgical operation like pleurotomy or thoracoplasty. Apart from disinfection of the pleural fluid, oleothorax helps to prevent the approximation of pleural surfaces and to improve the general condition of the patient by reducing toxæmia. In many cases, such a marked improvement takes place that a major operation like thoracoplasty is not needed.

The choice of a method of treatment will depend on whether the underlying pulmonary parenchyma is diseased or not and the empyema is due to tubercle bacilli alone or in association with secondary organisms. If the underlying lung parenchyma is apparently healthy, our aim should be to obliterate the pleural cavity by allowing it to expand. If there is accompanying involvement, especially cavitation of the underlying tissues, we should aim at keeping the lung collapsed.

In simple tuberculous empyema without apparent lung lesion we should evacuate the pus as completely as possible by gas replacement where indicated and replace by oil. The results are good where the whole pleural surface is bathed with oil. If the pus is thick, one might have to thin it with Gauvain's solution or with chloramine-T or with pepsin solution.



Case 3. Fig. 3.—Dated 1st March, 1935. One and a half months after right phrenic evulsion—diaphragm one inch higher. Compressive oleothorax being carried on.



Case 4. Fig. 1.—Dated 20th July, 1934. Productive but active infiltration and cavitation in left upper lobe. Collapse interfered with by adhesions. Tuberculous empyema.



Case 4.—Fig. 2.—Dated 22nd November, 1935. Same case after oleothorax treatment. Infiltrations mostly resorbed and fibrosed. Empyema inspissated and lung expanded.



Case 5.—Dated 2nd February, 1937. Appearance of parenchyma and empyema cavity (partly filled with oil) 14 months after commencement of oleothorax therapy. The dark appearance is due to thickened pleura.

# PLATE XIII



Case 6. Fig. 1.—Dated 24th April, 1936. Empyema left, lung lesion in left sub-apical area still active. Patient losing ground. A small cavity in left sub-apical area is indicated by an arrow.



Case 6. Fig. 2.—Dated 2nd February, 1937. As a result of oleothorax, the exudation of pus has stopped, the patient has considerably improved and joined work.



Case 7.—Dated 22nd December, 1936. Left tuberculous empyema improved by oleothorax and finished with thoracoplasty.



Case 8.—Dated 30th August, 1932. Pus formation stopped, but spontaneous pneumothorax took place—oil removed to relieve pressure.

If the character of the pus does not change or if there is prompt re-formation of the fluid, we have tried to destroy tubercle bacilli by introducing 5 to 20 c.cm. of 2 per cent methylene blue in absolute alcohol in gradually increasing doses at weekly intervals, as too frequent introduction may cause a bloody effusion.

If secondary infection is present and if oleothorax fails, a closed intercostal drainage and irrigation (with 0.1 per cent gentian violet solution) might improve the condition, if there is no bronchial fistula. If there is a large bronchial fistula, rib resection and open drainage may be done, to be followed by thoracoplasty. In a case of simple tuberculous empyema with lung lesion, we should maintain the collapse by pneumothorax and oleothorax or with oleothorax alone where the lung lesions are found to be active. The quantity of oil to be introduced and its frequency depend on whether a superficial cavity is present in lung parenchyma or not, as in the former case there is danger in introducing much oil at a time for fear of exerting too much pressure and producing spontaneous pneumothorax. If oleothorax fails, thoracoplasty with or without preliminary phrenic evulsion has to be done. In some cases, intercostal drainage and lavage might help in improving the condition of the patient and rendering him fit for thoracoplasty. The worst prognosis has to be given for such of these cases where secondary organisms infect the empyema.

#### *Technique*

Olive oil seems to us to possess several advantages over paraffin oil as a vehicle for gomenol in disinfection oleothorax, as explained earlier in the paper. The preparation of gomenolized oil having been done as previously described, we have to test the sensitiveness of the pleura, which varies differently in different cases. The irritability of the pleura is expressed by increased exudation inside the pleural cavity and by constitutional signs like fever, chills, pain, etc., nausea, vomiting and prostration. It is not wise to re-introduce oil before the reactions have completely subsided. Sometimes the contact of the oil itself reduces the irritability of the pleural membrane. The oil should be at a temperature between 100°F. and 105°F., which can be had by placing the oil flask in hot water and by warming the syringe before use.

The effusion or pus is withdrawn as completely as possible with gas replacement where necessary and 5 to 10 c.cm. of 2 per cent gomenolized olive oil is introduced into the pleural cavity. If there is no febrile reaction within a week, 10 to 20 c.cm. of 5 per cent oleogomenol are introduced. At the end of two weeks, the patient is examined under x-rays (with the patient lying down on his side to indicate the presence and nature of adhesions) and, if no fresh fluid formation has taken place, 50

to 100 c.cm. of 5 per cent oleogomenol are introduced, after ascertaining that the pressure in the pleural cavity before inducing oleothorax was frankly negative (never plus or zero, as a cavity may communicate with the pleural space). If there is no temperature, introduce 200 to 300 c.cm. of 5 per cent oleogomenol after a fortnight. If a temperature reaction is noticed after the introduction of oleogomenol, suspect fresh fluid exudation and examine by x-rays.

The needle for the introduction of olive oil should have a bore of 0.7 mm. and should be short. The danger of using needles of wider bore is that oil and pus may leak and leave a pleuro-cutaneous fistula or a cold abscess under the skin. To avoid these, we penetrate the muscular layers a little beyond the skin puncture. An additional precautionary measure is to introduce a few drops of iodine inside the puncture track after withdrawal of the needle. The puncture point of the needle for the withdrawal of pus should be in the lowest part of the mid-axillary line, so as not to disturb the posterior region of chest for a future thoracoplasty, and the patient should sit up and lean slightly forwards to ensure as complete an evacuation as possible. After withdrawal of the pus, the patient is made to lie in the dorso-lateral position and the oil is introduced through a puncture in the anterior axillary line about the level of nipple, to avoid leakage of pus and infection of the needle track. A syringe with a 4-way stop-cock is a great convenience in operative technique in these cases, but we have used, at various times, a Dieulafoy 2-way syringe, a transfusion syringe, and 20-100 c.cm. Record syringes connected to an A P needle through rubber tubing.

The skin has to be carefully sterilized with tincture of iodine and alcohol, the proposed track is then infiltrated with novocaine solution and the oil needle introduced. After the preliminary evacuation of pus, air in the pleural cavity is to be gradually released as oil is introduced. The amount of oil introduced should be about half to two-thirds the quantity of pus evacuated. The final pressure, estimated through water manometer, should not exceed zero, as a rule. It is important to leave a slightly negative pressure above the oil. The presence of the oil, however, is much more important to gauge, in order to prevent serious mediastinal displacement. Bernou uses an oleo-manometer for this purpose which is a bit cumbersome. A rough and easy method of estimating it is by withdrawing the syringe, while it is still full of oil, keeping the needle *in situ*. If the oil overflows, it indicates positive pressure. The needle can also be connected with an empty glass syringe (without piston), when, if increased pressure is present, the oil will be seen to rise into the syringe. In order to get a uniform idea, it is necessary to use a needle of the same calibre on each occasion.



If the pus is thick or if the empyema is of a virulent or toxic type, the pleural cavity should first be completely emptied of pus, then washed out with warm physiological saline and, lastly, oleo-gomenol introduced. The immediate result in these cases is a fall in temperature, but, if it rises again, the same method of aspiration, irrigation and oil replacement should be repeated until the temperature falls. After the temperature remains normal, irrigations are not needed and the oil bath of the pleura suffices.

*Complications.*—Apart from pleural sensibility or reactions which may occur in some cases, perforation of visceral pleura may occur, due probably to the re-activation of tuberculous foci lying under the pleural surface. Small perforations may be intermittent; gomenol-oleothorax may help to close them. Even if it does not close the perforation, it may prevent complications and may help to prepare the patient for thoracoplasty. Patent perforations can be verified by instilling a few c.cm. of a 1 per cent solution of methylene blue in saline when the coloured fluid is expectorated. If it occurs after oleothorax has been done, the usual signs are some pain and displacement of mediastinum and the escape of gomenol fumes into the bronchi and the expectoration of the oil. If this occurs, the oil must at once be withdrawn and the effusion, if any occurs, should be periodically withdrawn to prevent the level of the exudate reaching the perforation point and thus escaping into the bronchi. In these cases, thoracoplasty has to be advised.

Other complications which may arise in the course of treatment are pleuro-cutaneous fistulæ and threatened empyema necessitatis.

### Results

Tuberculous empyema, under conservative treatment, has a gloomy outlook. The outlook has improved considerably with the adoption of major and minor surgery.

We had to deal with 14 cases of tuberculous empyema, in whom oleothorax treatment was adopted, four without lung lesions and 10 with lung lesions. In the former group, two recovered and two died. Of the two deaths, one had spontaneous pneumothorax (case 8 in our series) and the other was a case of virulent or toxic effusion. Of the 10 cases with lung lesion, three died and seven have shown marked improvement. Of the three deaths, two died of bilateral disease and one died of spontaneous pneumothorax. Of the seven cases in which improvement is recorded, two required subsequent thoracoplasty (case 7 is one of them), two have not required this operation (case 4 is one of them) and three have considerably improved but may require thoracoplasty later on (cases 5 and 6 are among them).

Matson (1932) in his series of 50 cases, treated in the course of seven years and observed for a minimum period of three years,

obtained satisfactory results (i.e., empyema cleared up and the collapse was maintained by air or oil) in 60 per cent of cases. In the remaining 40 per cent, failure was due to pleuro-pulmonary and pleuro-cutaneous fistulæ, and failure of disinfection or re-formation of pleural exudate. Fontaine's (1929) and Marie's (1929) figures are almost identical.

### Remarks

Oleothorax, if the cases are carefully chosen and the treatment is properly conducted, has been shown to be a valuable adjunct to collapse-therapy in pulmonary tuberculosis and to the treatment of tuberculous pleural effusions. The method has been and can be applied to cases attending the outdoor department of a well-conducted hospital. The results obtained by us compare favourably with those obtained in Europe and America.

*Case 4.*—Mrs. N. B. D., a Hindu female, aged 22 years, had pleurisy on the left side in 1930. She was at the Madanapalle Sanatorium for a year (1933-34) for the treatment of tuberculosis of the left lung, where she was treated with artificial pneumothorax and sanocrysin therapy. She developed an effusion and was discharged as clinically cured. When she came to us on 23rd March, 1934, we found active but fibrosing lesions in the left upper and middle zone and an empyema reaching up to the level of the second rib (plate XII, figure 1). She complained of a slight cough but no fever. The maximum daily oral temperature was, however, found to be 99°F. and pulse rate 90 per minute.

*Treatment.*—The pus was withdrawn and disinfective oleothorax was done four times in the course of one and a half years. In between oleothorax she received 2 to 10 c.c. of 2 per cent methylene blue in absolute alcohol into the empyema cavity. The present condition is seen in the skiagram (plate XII, figure 2). The patient is doing a moderate amount of work. In view of the improvement obtained, thoracoplasty was not necessary.

*Case 5.*—R. N. A., a Hindu male, aged 27 years, was undergoing artificial pneumothorax for infiltration in the right upper lobe at the Lucknow Medical College, since 1934, and had an effusion three months before he came under our care on 7th January, 1935. He had a slight cough and fever with a maximum daily rise of temperature 100°F. for three months.

The patient was moderately wasted, pale and toxic. The right lung was fairly collapsed and the pleural cavity contained a purulent effusion up to the level of the fifth rib.

Sputum was tubercle bacilli negative, but the effusion was positive.

*Treatment.*—Pus was aspirated five times and was replaced by oleo-gomenol. The pus became gradually thinner and ultimately disappeared after 14 months (plate XII). The lung lesion showed good fibrosis. The patient regained weight considerably, became afebrile and resumed his duties. As the right lung was failing to expand, he was advised thoracoplasty one year ago, but the patient has not been able to make up his mind yet.

*Case 6.*—B. N. C., a Hindu male, underwent artificial pneumothorax at Jadavpur Tuberculosis Hospital for infiltration and cavitation in the left sub-apical area for eight months from July 1935, during which time he developed pleural effusion (plate XIII, figure 1). He was discharged in March 1936 and came under our care, when we found tuberculous empyema up to the second rib. The patient was having temperature and losing weight.

(Continued at foot of opposite page)

## THORACOPLASTY IN PULMONARY AND PLEURAL TUBERCULOSIS

By P. V. BENJAMIN, M.B., B.S. (Madras), T.D.D. (Wales).  
Assistant Medical Superintendent, Union Mission Tuberculosis Sanatorium, Arogyavaram, near Madanapalle, South India

### Historical survey

THORACOPLASTY as an operation for pulmonary tuberculosis is being increasingly used with encouraging results in modern tuberculosis institutions. In the latter part of last century there developed two methods of trying to secure a closure and consequent healing of cavities both

(Continued from previous page)

*Treatment.*—Gomenol-oleothorax was done on three occasions, after aspiration of pus. The pus formation seems to be stopped now, the patient has been afebrile for three months after the first aspiration and has joined his work. The infiltration in the lung parenchyma has cleared up (plate XIII, figure 2). The patient is being watched.

*Case 7.*—B. K. N., a Hindu male, aged 32 years, first came to us in 1932, with a history of low evening fever and cough for two months. Skiagram of the chest showed exudative infiltration and cavitation in the left upper lobe. The sputum was tubercle bacilli negative.

The patient went away and had artificial pneumothorax treatment in different sanatoria. He came back to us towards the end of 1934 with pleural effusion which was found to be tuberculous empyema.

*Treatment.*—The pus was aspirated several times and replaced by oleo-gomenol. The formation of pus was thereby greatly checked but as the patient was not making steady improvement, he was advised thoracoplasty. Left phrenic evulsion was done as a preliminary step. Thoracoplasty was done in two stages towards the end of 1935 (plate XIII). Since then the patient improved considerably and became free from all symptoms.

*Case 8.*—A. K. G., a Hindu male, aged 25 years, came in May 1932 with tuberculous empyema of the right side, low fever and emaciation. Between May and August 1932, pus was aspirated four times and replaced by oleo-gomenol, commencing with 2 per cent and gradually increased to 10 per cent. Pus formation stopped and the patient improved and went home. He came back after a couple of weeks with spontaneous pneumothorax and died in hospital (plate XIII).

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based on the same principle. One of these methods was that of artificial pneumothorax introduced by Forlanini. The other started with the assumption that it is largely the rigidity of the chest wall which prevents the walls of a cavity from collapsing where fibrous tissue tends to retract the lung.

Quinke (1888) therefore proposed that the ribs over the affected lung should be mobilized by resection to give free play to the natural process of healing by retraction. Two years later Karl Spengler adopted this method in dealing with cases complicated with pleural effusion, but by 1903 he had developed the operation now known as extra-pleural thoracoplasty. Still the results of these earlier operations were very imperfect and uncertain. It was Brauer followed by Friedrick (1907) who advocated extensive rib resection. They reasoned that a collapse approximating to that obtained by artificial pneumothorax must be achieved before it could be hoped to obtain the same results. Although the theory was right, the operation was attended by a very high mortality and it was only between 1911 and 1913 that Wilms and Sauerbruch developed the technique of the present-day thoracoplasty—'extra-pleural paravertebral thoracoplasty'. The principle of this operation is the removal of the posterior ends of the ribs as far back as the transverse processes of the vertebrae. The removal of comparatively small segments of the posterior ends of the ribs gives greater collapse of the lung than the removal of larger segments of the anterior or lateral portions. At the same time it was recognized that it was essential that part of the first rib should also be removed, as this greatly influences the collapse.

Since that time the operation has gained popularity all over the world.

### Selection of cases for thoracoplasty

In all cases where surgical intervention is indicated, artificial pneumothorax is the method of choice, as it produces a better collapse, if adhesions are not present; it is of less strain to the patient and it can be stopped at will, if the other lung gets worse.

If pneumothorax fails, owing to the presence of adhesions, the ideal case for thoracoplasty is one with a unilateral lung affection of a chronic proliferative type in a patient whose general condition is comparatively good. Such cases usually have cavities and a tendency to retraction of the lung seen by the falling in of the ribs and by the dragging of the mediastinum towards the affected side. These signs show that Nature is attempting to deal with the disease, but unfortunately Nature's attempts frequently fall far short of what is required. Immobilization of the ribs over the affected area helps this natural process.

Among Indian patients, however, such ideal cases are rarely seen. The disease is not often

unilateral and instead of the chronic fibrotic type are found more frequently the acute or semi-acute exudative types. But experience has shown that good results can be obtained by thoracoplasty in many of these cases, although not ideal; for many of them no other procedure is known which can offer hope of improvement.

In the selection of these cases and in the decision as to the type and extent of the operation, the utmost co-operation is required between the physician and the surgeon. The best would be that the surgeon and the physician be the same individual, but this is not always possible. The physician is in a better position to understand the various problems connected with tuberculosis, especially the question of allergic and focal reactions and the immuno-biological factors which vary from time to time even in the same individual, and in planning the operation the surgeon has to take into consideration the results of this individual study of the patient by the physician. Following a standardized technique described in textbooks without this individual study is bound to lead to failure. This is recognized as a necessity by all chest surgeons in the West and it is even more necessary in India where we have to deal with non-ideal cases.

It has to be emphasized in this connection that it is of the utmost importance for the patient to be treated on sanatorium lines after the operation. The operation is only a help to supplement the natural healing process which is best achieved under sanatorium regime.

#### *Contra-indications*

The most important contra-indication to thoracoplasty is, of course, widespread contralateral affection. Extensive emphysema, bronchitis or asthma or any other condition which seriously reduces the vital capacity; myoearditis, serious kidney disease or advanced tuberculous enteritis are all contra-indications. Wasting may be present, but not extreme cachexia. Patients over 45 years of age do not stand the operation well.

#### *The extent of rib resection required*

In the earlier years of the operation the rule was always to do a total thoracoplasty either in one or several stages, even if there was only an upper lobe affection. But the modern tendency is to confine the collapse of the lung as much as possible to the diseased areas and to leave the healthy parts to function normally. In the majority of cases as the disease is confined to the upper and middle zones, a partial upper thoracoplasty is all that is required. This modern technique of localized thoracoplasty has even made it possible to do a bilateral thoracoplasty when the disease is confined to the upper lobes of both lungs.

In earlier years also a preliminary lower thoracoplasty, and in some cases a phrenic

evulsion, was done with the idea of preventing an extension of the disease to the lower healthy part of the lung by secretions from the collapsed upper part after operation. The danger of such an extension, however, is not a very real one, and these preliminary operations are now considered unnecessary and may even be harmful when the lower lobe is free from the disease. But when the lower lobe is affected a complete thoracoplasty is essential, even if the upper lobe is free.

Occasionally, when the cavities are very large a posterior thoracoplasty may not be enough to secure a complete collapse. Then a supplementary anterior thoracoplasty or in some cases a supplementary extra-pleural pneumolysis may be required.

#### *Stages of the operation*

The number of stages in which the thoracoplasty operation is to be done is still a matter of controversy. But this is mainly when a complete thoracoplasty is done in patients with a unilateral chronic affection such as is found in European patients.

In Indian patients, where the disease is more acute with the possibility of severe allergic reaction following the operation, tending to spread the disease, our experience has shown that there is not much doubt that a complete thoracoplasty in one stage is exposing the patient to an unnecessary danger. Even a partial thoracoplasty in some patients may have to be done in two stages, removing only three or four ribs at a time.

#### *Thoracoplasty in tuberculous empyema*

There are certain types of tuberculous empyema either produced by a pulmo-pleural fistula or developed as a complication in artificial pneumothorax treatment where the closed method of aspiration and drainage even with negative pressure suction apparatus may not allow the lung to expand and obliterate the pleural cavity. It is well known that in old-standing cases of empyema the visceral pleura gets so thick that it is difficult or impossible to expand the underlying lung. In such cases complete thoracoplasty is often necessary to bring the parietal and visceral pleura into apposition that they may become adherent. Here the operation is a much more severe one than in ordinary lung tuberculosis as a complete removal of all the ribs, and not only the posterior ends but the anterior ends also, may be necessary. The operation may have to be done in several stages. In some cases the pleura may not become adherent even with these extensive rib resections, and it may be necessary in such cases to remove the parietal pleura and stitch the muscles directly over the visceral pleura or allow the wound to heal by granulation from the bottom.

PLATE XIV



Fig. 1.—Mrs. F. G. On admission large cavity infra-clavicular region infiltration left base.



Fig. 2.—Mrs. F. G. After phrenic evulsion and sanocrysin treatment cavity smaller, but sputum level seen in cavity—left base clearer. Left diaphragm higher.

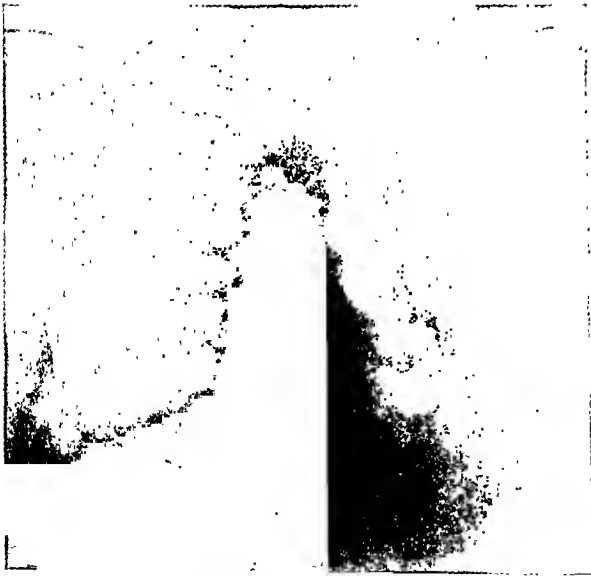


Fig. 3.—Mrs. F. G. After thoracoplasty. Cavity collapsed.



Fig. 4.—K. J. On admission. Pleural thickening left side—but cavity seen upper zone.

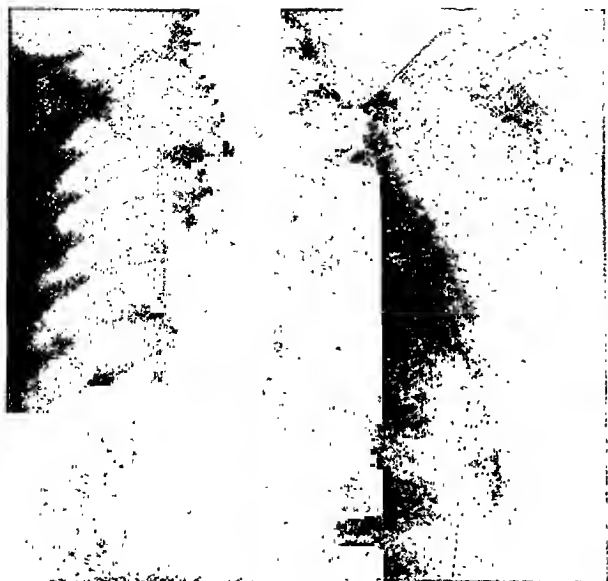


Fig. 5.—K. J. After thoracoplasty.



Fig. 9.—Mrs. E. F. On admission, spontaneous pneumothorax. Photo after aspiration of empyema.

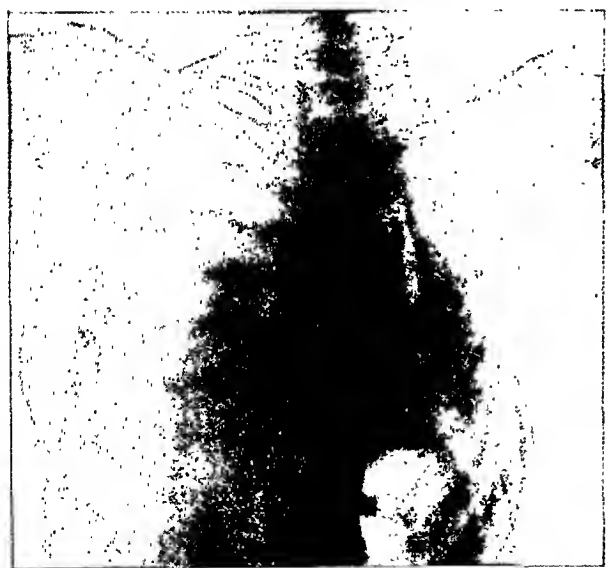


Fig. 10.—Mrs. E. F. After thoracoplasty first two stages, lower pleural space still not obliterated.



Fig. 11.—Mrs. E. F. After thoracoplasty third stage. Complete obliteration of pleural cavity.

*Review of cases operated on in U. M. T. Sanatorium, Arogyavaram*

Since November 1932, 26 thoracoplasty operations in 17 patients have been performed at this sanatorium. In 14 of the patients the operation was done for pulmonary tuberculosis, and in three for tuberculous empyema.

In 13 of the 14 patients operated on for pulmonary tuberculosis, the operation was an upper posterior paravertebral thoracoplasty. In these cases from 5 to 8 ribs were removed in one stage, except in one patient; 7 ribs being the maximum removed in one stage.

The results of these cases are as follows:—

TABLE

Operations	Much improved	Improved	Worse	Died
13	7	2	1	3

It will be seen that 9 out of 13 of these patients obtained positive results, and of these 7 were 'much improved'. All the 13 patients had tubercle bacilli in the sputum at the time of operation and in 6 the bacilli disappeared in one to three months after.

There was no immediate operative mortality in the 26 thoracoplasty operations. Of the three patients who died, one died four days after the operation of acute dilatation of the stomach; another died on the 11th day most probably because of a general dissemination of the disease; the third death occurred about a year after the operation.

In one case a full antero-lateral thoracoplasty was done because the patient was too weak to stand the more severe posterior thoracoplasty. The operation was done in two

stages, the anterior ends of ribs 1 to 5 being removed in the first stage and the lateral segments of ribs 6 to 10 in the second stage. The patient has improved considerably, but bacilli are still present in the sputum (four months after the operation) and collapse of the lung is not marked. It may ultimately be necessary to do a posterior thoracoplasty.

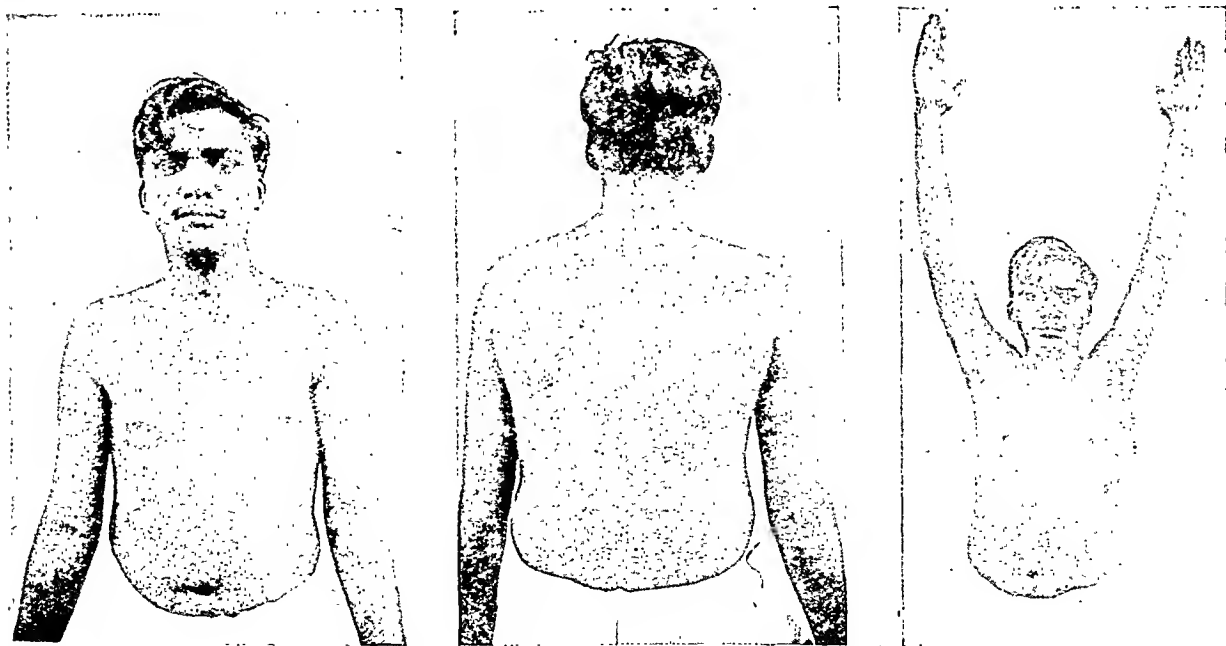
The three cases in which thoracoplasty was done for tuberculous empyema have all improved. One patient is alive and well, nearly two years after the operation. The other two are still under treatment, six months and two months after the operation, and both have improved much.

*Illustrative case notes*

(1) Mrs. F. G., aged 30; admitted 15th September, 1931. Left side extensively affected, with large cavity about three inches in diameter in infra-clavicular region. Temperature on admission 100°F. to 100.6°F.; tubercle bacilli present in sputum. Artificial pneumothorax attempted on 25th September, 1931, but failed; phrenic evulsion on 3rd October, 1931, because lower lobe was also affected. Two courses of sanocrysin given. Lung improved, cavity shrunk to two inches diameter, but sputum still positive. On 24th November, 1932, upper posterior thoracoplasty, ribs 1 to 7 being removed. Patient discharged 'much improved' on 17th April, 1933, and is still alive and well over three and a half years later (plate XIV, figures 1 to 3).

(2) K. J., male, aged 23; admitted 19th June, 1933, from another sanatorium where he had been since 1930 and had had artificial pneumothorax, 25 injections and phrenic evulsion. Admitted here for thoracoplasty. Patient had extensive affection on left side with large cavity in upper zone; pleura thickened; vocal chords ulcerated. Fever 100°F. to 101°F. Sputum tubercle bacilli positive. On 25th July, 1933, left upper thoracoplasty; ribs 1 to 6 removed. Within one month patient had no fever and no bacilli were found in the sputum. Discharged 26th February, 1934, as 'much improved' and is still keeping well and working as a teacher, nearly three years later (plates XIV and XV, figures 4 and 5, and text-figures 6, 7 and 8).

(Continued at foot of next page)



Figs. 6, 7 and 8.—Patient two years after discharge—no deformity, and function of the arm good.



## THE TREATMENT OF CERVICAL GLANDULAR TUBERCULOSIS

By F. M. COLLINS, M.chir. (Camb.), F.R.C.S.  
MAJOR, I.M.S.

*District Medical Officer, The Nilgiris, Ootacamund*

GLANDULAR tuberculosis is probably the commonest manifestation of surgical tuberculosis in this country, and the cervical glands are those most frequently affected. The infecting organism enters the body sometimes through intact mucous membrane, but most often through some obviously diseased focus in the mouth—carious teeth, tonsils or adenoids. While the human tubercle bacillus may gain entry from dust or dried sputum, the bovine bacillus derived from infected milk is often the cause: in either case the bacilli pass along the lymphatics and settle in the glands which act as filters protecting the blood stream, especially if these glands are already, or have been recently, diseased.

*(Continued from previous page)*

(3) Mrs. E. F., aged 39; admitted 7th July, 1933, with high fever, very toxæmic. Found to have spontaneous pneumothorax on left, with empyema. This was treated by frequent aspiration and washing out by closed method and gomenol-oleothorax. Later, on sinus forming, a permanent open drainage introduced and frequent washing continued. The temperature was lower and general condition improved, but sinus persisted and there was no sign of lung expanding and obliterating pleural cavity. On 10th December, 1934, first stage of complete thoracoplasty, ribs 1 to 5 posterior ends removed; 23rd January, 1935, second stage, ribs 6 to 7 posterior ends removed; 22nd February, 1935, third stage, whole of 8th and 9th ribs and anterior ends of ribs 5 to 7 removed. Patient improved steadily, empyema cavity closed and sinus healed. Patient discharged on 15th March, 1936, as 'much improved' and is still alive and well (plate XV, figures 9 to 11).

### Summary

(1) A short historical survey is given of the development of the thoracoplasty operation.

(2) In dealing with selection of cases for thoracoplasty it is pointed out that the ideal unilateral cases of the West are rarely found in India, but yet good results can be obtained in selected non-ideal cases.

(3) Emphasis is placed on the necessity of the utmost co-operation between the physician and surgeon in planning the operation.

(4) The main contra-indications to the operation are given.

(5) The nature and extent of the operation and the number of stages required with reference to Indian patients are discussed.

(6) The scope of thoracoplasty in tuberculous empyema is described.

(7) Results are given of 26 thoracoplasty operations in 17 patients. Out of 14 patients operated on for pulmonary tuberculosis, 10 obtained positive results, and in 6 out of 14 tubercle bacilli disappeared from the sputum; three patients in whom thoracoplasty was done for empyema have all obtained positive results.

The infected glands pass clinically through stages from uniform soft enlargement at first discrete, soon becoming matted by peradenitis, to caseation, softening, liquefaction, involvement by the tuberculous process in turn of fascia, muscle and skin, secondary staphylococcal infection, abscess formation (often the typical 'collar-stud' abscess), rupture, sinus formation, and tuberculous involvement of the skin.

The pathological changes are most marked at the centre of the lesion, in the glands earliest affected, where caseation and liquefaction may be evident, while the peripheral glands, infected by retrograde lymph flow and not clinically evident, show merely enlargement and microscopic tubercles. The process may be arrested at any stage with shrinkage and calcification, the latter an event much less common in the neck than in the mesentery or mediastinum. More frequently unfavourable and untreated cases reach the final stages of sinus, scarring and scrofuloderma with the ever-present risk of general dissemination.

The diagnosis is seldom difficult though in theory the whole gamut of swellings of the neck should be passed in mental review. The patient is a young adult in fair health, the mass is of considerable size, matted, nodular, of uneven consistence, without a definite edge, with or without fixation to the fascia and skin. Often both sides are involved, though unequally: the axillary gland may be enlarged, and probably there are no other manifestation of tuberculosis. The upper anterior vertical glands are usually primarily and most extensively affected: less frequently other groups, e.g., upper posterior, or lower, or submaxillary, are the main seat of the disease. In practice two conditions only give rise to doubt: sub-acute or chronic non-specific inflammatory adenitis that occurs with, or is residual to, sepsis in the mouth and lymphadenoma: here, the glands are smaller, harder, of more uniform size and consistence, the spleen may be enlarged, the blood picture may show a secondary anaemia and there may be characteristic bouts of periodic fever of the Pel-Ebstein type. A pseudo-adenomatous type of disease is recognized, where the glands are unusually nodular and project markedly beneath the skin, and tuberculosis has been described as a late complicating lesion in the glands of Hodgkin's disease. Though painless in the early stages until pyogenic infection has ensued, tuberculous cervical adenitis forms an obvious unsightly mass in the neck, so that even in a country where the disease is notoriously late in reaching the surgeon, cases are generally seen at a stage when they should be amenable to treatment, and the problem arises as to what line of attack is best adopted in eradicating the trouble.

The source of infection being bacilli in the milk and their portal of entry some focus in the

mouth, the first step is the elimination of these two factors. Prophylaxis along these two lines has made tuberculous cervical adenitis, once a common complaint among the poor of the large towns in England, a comparatively rare disease in 1936.

Provision of tubercle-free milk is a matter for public health legislation, but boiling or better pasteurization of children's milk, with provision of the requisite vitamins destroyed in the process, is a simple precaution. Removal of tonsils (by enucleation, not by the guillotine) and adenoids, and treatment of dental caries are minor surgical procedures. 'Tonsils before glands' should be a routine procedure, the only possible disadvantage being that (as has happened in some cases of my own) the patient, frightened by the temporary discomfort of the tonsillectomy, may refuse further active treatment.

As in tuberculosis, generally, what is known as 'hygienic' measures is the essential part of treatment: were it possible, every case of tuberculosis, including glandular tuberculosis, would be treated in a sanatorium, or at least along sanatorium lines: unfortunately, in India we are very far from the stage where sanatorium beds are available for every case requiring accommodation. Moreover, it is my experience that not a few of the poorer and more ignorant people here lack the patience and perhaps too the confidence to persevere in a line of treatment the results of which are necessarily, and inevitably, slow: so often having at last abandoned unsuccessful lines of native medication, they expect something dramatic or even miraculous when at last they entrust themselves to the more orthodox 'systems'. It is essential that the case be removed from insanitary surroundings, especially from contact with other tuberculous lesions (*e.g.*, a case of phthisis in the same house), that adequate fresh food be provided, especially tubercle-free milk, butter, eggs, fruit and vegetables with plenty of vitamins, and that sunlight, fresh air and healthy occupation, with exercise, be adequate. Drug treatment must play only a subsidiary part and there is no specific.

In the early soft discrete stage iodides in the shape of syrupus ferri iodidi are effective: cod-liver oil and calcium should also be given as in tuberculosis generally. In later cases with periadenitis and softening, prolonged courses of tuberculin may do much good though results comparable to those obtained in genito-urinary tuberculosis are not usual. Radiotherapy in any form is seldom likely to be available: the value of radium or deep x-ray is doubtful, and, if unsuccessful, subsequent operation is certainly more difficult from the fibrosis that ensues. Artificial sunlight is hardly necessary in a country where natural sunlight is seldom lacking, but graduated general radiation of the whole body may act as a tonic in cases where

it is not possible to obtain adequate sunlight: local radiation to the neck is of value and my impression is that it constitutes a valuable post-operative measure.

There can be no disagreement as to the paramount importance of 'hygienic' treatment. Controversy arises as to how the glands themselves should be dealt with. Physicians point to the impossibility of removal of all the diseased glands which in practice, they say, never occurs. Recurrence is almost inevitable, sinus formation common after operation, cosmetic results poor, and atrophy and paralysis of muscles from nerve injury frequent; as it undoubtedly is, but naturally varies inversely with the experience of the surgeon. They urge that surgery should be confined to the aspiration or incision of abscesses, contending that in this way sinus formation and serofuloderma are at least no more frequent than following radical operation. On the other hand, surgeons hold that medical treatment is uncertain, slow and time-consuming, entailing regular attendance at a clinic for treatment and observation, with absence from school or work. They give equal importance by 'hygienic' measures, and regard operation as one stage only in the treatment as a whole: they point out that the surgery of tuberculosis does not pretend to aim at the complete eradication of the disease: rather the main bulk of the trouble is removed and the rest left to nature. They do hold however that the actual glands are more expeditiously and radically treated by a clean operation which aims at entire extirpation of the local disease, and as their experience increases they fear less the failures of recurrence and sinus formation. The results are best in the early case before softening and liquefaction is extensive: the failures of medical treatment are naturally less favourable. Though the problem is a perennial one, in Europe there has undoubtedly been a swing of the pendulum in favour of medical treatment, but it must be remembered that prophylaxis has greatly lessened the incidence there, and tuberculous relief, ensuring regular attendance at well-organized clinics, facilitates continuity of treatment. In India these factors do not prevail, and it is my contention that while hygienic treatment, approximating as nearly as possible to sanatorium conditions, is carried out as thoroughly as possible, operation is more likely to lead to a successful result than a purely medical regime. My particular object in this paper is to urge the case for early operation and perhaps to give some help to surgeons in remote stations where surgical amenities are not too good, and to encourage them to deal radically with these cases.

Two types of disease are definitely not amenable to operation: those rare cases of generalized infection of most of the gland groups in the body, and those cases where the lower deep

cervical glands are solely or primarily involved: here the infection has spread from a pulmonary or pleural focus, often showing signs of activity. Involvement of the lower group, secondary to the upper group, is no contra-indication. Surgery, though it may be only a phase in the medical regime, is imperative when the glands have passed the mobile uncomplicated stage. Abscess should be aspirated and emptied using an oblique approach without the injection of sclerosing emulsions. If the abscess rapidly re-fills and especially if a culture of the aspirated pus shows a secondary staphylococcal infection, it is wiser to incise and perhaps curette the walls, while the overlying tissues are still healthy, rather than to attempt repeated aspiration which is more likely to lead to a sinus along the needle track. The radical operation is one of some magnitude, and the operator must be prepared to make a clean sweep of every gland from the clavicle to the base of the skull. If possible the mass of glands is removed in one piece, but the operator must go carefully over the wound to see that not even the smallest gland remains. The extent of infection is notoriously greater at operation than is apparent clinically. When both upper and lower groups are involved, it may be right and generally wiser to do a two-stage operation through separate incisions. Both sides of the neck should not be operated on at one sitting.

Ability to perform this operation pre-supposes acquaintance with the anatomy of the neck. A sufficiently accurate idea of the position of the cervical glands is possible if they are considered as lying in two sets: a vertical set—the deep cervical glands divisible into upper and lower, anterior and posterior groups—and a horizontal set—the submaxillary and submental glands. The superficial glands which lie on, and not below, the deep cervical fascia (mastoid, pre-auricular, occipital, etc.) are seldom the seat of tuberculous disease, and, even if they are, are small, discrete and easily removable. The descriptive anatomy of the textbooks, of which it is out of place to speak here, is likely to be disappointingly inadequate in this operation: most of the well-described structures are not seen at all, and the importance of the fascial planes and of veins is out of proportion to their textbook prominence. Venous hæmorrhage, especially with unsatisfactory anæsthesia, is very troublesome. The operator must learn to know the appearance, if not the name, of a vein, whether distended or collapsed, and the ability to enter the right layer of fascia makes all the difference between an easy and tedious operation. Really good light and a competent assistant are two further essentials.

Anæsthesia is a matter in which the operator in India will have little choice: ether or ether-chloroform mixture given off a mask is perfectly satisfactory, though intra-tracheal gas-oxygen-ether is better, having the great

advantage of removing the anæsthetist and his apparatus from the operation field. If one end of a towel is folded to three or four thicknesses and the thickened edge fixed along the angle of the jaw with towel clips, and the free end then turned back over the anæsthetist's hand supporting the jaw and holding the mask, satisfactory exclusion of the operation field is secured. I have seen some brilliant neck dissections under local infiltration but would not recommend this method to a surgeon who operates on only a few cases every year.

The incision is transverse in the skin folds of the neck and extensive over the most prominent part of the tumour, wherever this lies. Sinuses and unhealthy skin are excised in the transverse incisions. Two parallel transverse incisions are better than any vertical extension. Three or four skin scratches at right angles to the proposed incision are made, so as to secure accurate coaptation of the flaps, which are apt to slide sideways with the head turned to one side and extended over a sand bag. The transverse incision must have been unknown a generation ago, as one all too frequently sees adults with conspicuous stretched scars resulting from incisions parallel to the sternomastoid. The wound is very accurately closed in layers with a continuous stitch uniting the platysma, followed by an intradermic skin suture: this with practice takes little longer than any other, and is always worth while when the resulting linear scar is considered. The incision is carried through skin and platysma, and wide flaps are turned upwards and downwards well clear off the glandular mass in every direction: the flaps should be as thick as possible and protected with tetracloths and hot towels, otherwise sloughing of their margins may mar the result.

The flaps turned aside, dissection proper begins, and this must be methodical and systematic, the operator proceeding cleanly from step to step. Knife and scissors only are used, blunt dissection either with an instrument or the finger, though hard to resist, is prohibited, and will certainly lead to disaster from rupture of a caseating gland, or from tearing of veins. The first step is to define clearly the borders of the sternomastoid by incising the deep cervical fascia along its margins. The deep surface of this muscle is cleared from the lowest lying glands and retracted backwards, and the inferior belly of the omohyoid cleaned and retracted downwards. This exposes the carotid sheath, which is deliberately opened from behind by a small vertical cut, below the largest palpable gland: if opened from behind, the cellular tissue of the sheath with the loop of the hypoglossal nerve is easily pushed forwards out of harms way. If the lower deep cervical glands are enlarged and are to be removed at a second stage operation, an artificial separation must be made, a more difficult procedure: otherwise it is essential that the lowest glands are taken

first. The glands are now stripped from behind and below, upwards and forwards, until the common facial vein is reached: by working forwards the large middle thyroid veins are seen and secured before division, as is the common facial vein not too close to its junction with the internal jugular.

At this point I always abandon the dissection from the front and start removal of the glands from the muscles forming the floor of the posterior triangle, working from below, upwards and forwards. Here caution is needed until the spinal accessory nerve is found, sometimes above, sometimes below, sometimes imbedded in the glands: once found it is picked up on a blunt hook, and deliberately isolated until it is lost to view as far forwards as possible beneath the sternomastoid: the glands can then be freed from the posterior triangle muscles, and from the deep surface of the sternomastoid until the whole mass is pushed beneath that muscle to the front. The anterior primary divisions of the cervical nerves lie beneath a distinct layer of fascia on the floor of the posterior triangle, and, provided rough dissection does not open this layer, they are not in any danger. The dissection is resumed in front of the sternomastoid, working upwards and forwards, the spinal accessory nerve picked up again and freed to the point where it disappears from the operation field across the transverse process of the atlas beneath the digastric muscle: the posterior belly of this muscle, lying at about the same level as the common facial vein already isolated and ligatured, forms the next landmark, and, keeping in this plane, the glands are freed forwards and upwards until their limits are reached. Part of the parotid gland may be shaved off with a knife, and the submaxillary salivary gland is removed together with the submaxillary and submental glands: all these lie on the fascial plane which covers the digastric, hyoglossus and mylohyoid muscles, which fascia effectually protects the vessels and nerves of this region. The deep part of the submaxillary gland lying on the hyoglossus can be taken if need be, and in every case Wharton's duct is crushed, cauterized and ligatured, but if this is done a deep wound is left at the side of the tongue at the bottom of which deep bleeding, difficult to control, is apt to occur. The dissection is completed when the uppermost and most anterior (submental) glands are freed and the whole mass, which is usually of cruciate shape with limbs 3 or 4 inches in length, is removed. Scrupulous arrest of bleeding, irrigation of the wound with hot saline, suture as described, with provision for drainage through a stab in the lower flap, a very thick pad of gauze and wool, and a bandage secured to the jaw with collodion complete the operation. The large dressing, which takes in the head and both axillæ as well as the neck, acts as a

(Continued at foot of next column)

## OXYGENATION OF THE PERITONEAL CAVITY IN THE TREATMENT OF TUBERCULOSIS OF THE ABDOMEN\*

By NANDLAL BORDIA, M.B., B.S.

*District Medical Officer, Indore District, Indore, and  
Medical Officer in charge, Rao Sanatorium*

IN this article I propose to deal with the treatment of abdominal tuberculosis by oxygenation of the peritoneal cavity without making any reference to general treatment, so as to make the article reasonably brief and concise.

\* Rearranged by the Editor.

(Continued from previous column)

splint to secure immobilization of the operation area. The dissection may take perhaps 75 minutes and it is not surprising that it is associated with some shock, which passes off quickly once the wound is dressed and the usual restorative measures adopted. This description applies to the commonest type of case where the upper, anterior and posterior groups of the vertical chain are the most extensively infected. In other groups the same principles apply: adequate flaps with a transverse incision, clear definition of the important anatomical structures and complete removal of the glands by sharp dissection from these structures, commencing at the periphery, where the least infected and least adherent glands are most easily freed.

The dangers of the operation are nerve injury and hæmorrhage: both are avoided by clean cutting and adequate incisions. The spinal accessory must always be isolated and recognition of fascial planes will protect the others. Veins should be secured before division: deliberate exposure at an early stage protects the internal jugular vein: a wound of this size may be safely closed with a lateral ligature and there need be no hesitation in excising a segment with adherent glands, a procedure which is simple if its lower end has been cleanly isolated. The danger of air embolus has probably been exaggerated and can only result from rough operation.

Convalescence is usually smooth: some swelling around the wound from exudation of lymph from divided lymphatics is inevitable and is minimized by the abundant pressured dressing. A diffuse tuberculous cellulitis which causes swelling of the whole of the side of the neck is an unfortunate but rare complication.

The view is advanced that under the conditions prevailing in this country, early radical operation is the soundest method of dealing with the local manifestations of cervical glandular tuberculosis, and some points in the practical surgical technique are stressed in the hope of encouraging this view.

In Central India tuberculosis of the abdomen is often found without being associated with pulmonary tuberculosis. It is the commonest form of tuberculosis met with in this part of the country and lung infection is usually secondary to abdominal disease. For some years the treatment adopted has been exploration of the abdomen and again closing the peritoneal cavity without doing anything inside. This was found to be useful. It was believed that it is the exposure to the atmospheric air, or probably oxygen contained in the air, that inhibited the growth of the tubercle bacilli. On this assumption Lieut.-Col. Tyrrell introduced intra-peritoneal administration of oxygen, about the year 1920. In all cases of abdominal tuberculosis a preliminary exploration of the abdomen was first performed to confirm the diagnosis and to ascertain if there were any adhesion of the gut to the peritoneum forming the part of the anterior abdominal wall. The abdomen was opened by a one-and-a-half-inch-long incision in the middle line, the contents were examined visually and by introducing a finger to feel any glands, adhesion, matting of the gut, or thickening of the peritoneum. If there was any evidence of tuberculosis the abdomen was closed and a small cannula of 1 mm. bore was introduced inside near the last knot in the peritoneum. The wall was sutured, the outer end of the cannula being kept out and the inner end inside the cavity. Now oxygen was introduced in the following way:—

Two flasks (wash bottles) of 500 c.cm. capacity, one of which is graduated, with the necessary rubber connections are required. The graduated flask is filled with perchloride lotion (1 in 1,000). Oxygen is passed from the cylinder into the graduated flask displacing the lotion into the second flask. The graduated flask is now connected with the cannula and by raising the second flask the oxygen is forced into the peritoneal cavity. The level of the lotion in the graduated flask indicates the amount of oxygen introduced.

Nowadays preliminary exploration is tried only in doubtful cases. If there is a tumour or suspected adhesion, exploration is done first, otherwise in every straightforward case oxygen is introduced by the following way:—

The skin and the abdominal wall are anaesthetized by 1 c.cm. of 2 per cent novocaine solution. The site chosen is about 1 inch below and lateral to the umbilicus. A sharp-pointed Graefe's knife is plunged perpendicularly through the skin, subcutaneous tissue and muscle at the anaesthetized spot. The trocar with the cannula attached is introduced into the knife puncture and gentle pressure applied. As soon as the peritoneum is punctured the patient experiences a sharp pain. Now the trocar can be pulled out leaving the cannula *in situ*, which then is freely movable up and down if it is inside the

cavity. There is no danger in this procedure as the end of the cannula is blunt. Now the adaptor is fitted to the outer end of the cannula and gas allowed to flow in. The lotion in the flask rises freely if the gas is escaping into the peritoneal cavity.

#### *Difficulties during operation*

(1) It may be difficult to judge when the peritoneum is reached, but free movement of the cannula by manipulation and free escape of gas are enough to show that the cannula is inside, otherwise the trocar must be introduced into the cannula and further bored down to penetrate the peritoneum. In a short time after doing a few oxygenations the operator can easily judge when it is inside.

(2) Even if the peritoneal cavity is reached the omentum may block the end of the cannula, but it can be easily cleared by moving the cannula up and down and allowing gas to flow under pressure by raising the flask.

(3) The gut may be punctured if it is adherent to the abdominal wall and a faecal fistula may result. But in such doubtful cases exploration of the peritoneal cavity must always be tried first.

(4) Any of the large blood vessels may be punctured if the trocar is introduced injudiciously. I have never met with the last two accidents yet, and have seen and done the little operation hundreds of times.

*How much gas to introduce.*—After exploration about 200 c.cm. of gas is sufficient on the first occasion, but the quantity on later occasions varies according to the size of the abdominal cavity. Formerly, when oxygen was introduced without measuring, the hollow note produced by percussing was a sufficient indication that the abdomen was full of gas. The obliteration of liver dullness is another good indication that enough gas has been introduced, provided there are no adhesions.

Every week the quantity is increased till about 350 to 400 c.cm. and, rarely, even 500 c.cm. of oxygen are introduced at each operation. If there are adhesions it may be impossible to introduce more than 100 c.cm. without causing severe pain afterwards. Therefore, it is always wise to start with a small dose and then increase it gradually watching the condition of the patient.

#### *Post-operative complications*

(1) *Pain.*—This is a common complaint when the quantity of gas introduced is a large one, i.e., after 500 c.cm. at the first sitting or if there are adhesions inside.

(2) *Temperature.*—In the majority of cases the temperature tends to fall in uncomplicated cases, but if associated with extensive pulmonary tuberculosis the temperature may shoot up if a large amount of gas is introduced.



(3) *Dysentery-like condition*.—Rarely, on account of congestion of the vessels, there is a blood-stained exudation inside the intestine and mild attack of a dysentery-like condition may result, which subsides as soon as the gas gets absorbed, usually in 4 or 5 days.

(4) *Surgical emphysema*.—If the gas is allowed to escape into the abdominal wall this complication occurs, but is not troublesome.

### Results

I. In the early stages when there are minute tubercles on the peritoncum this form of treatment is at its best.

There are records of a very large number of cases, but it will be sufficient to quote only a few here:—

*Case I.*—A Mohammedan Bohra female, aged 25 years, was admitted to the M. T. Hospital for abdominal pain and high continued fever, the temperature ranging from 103° F. to 104° F. She was very weak and weighed 68 pounds. She was delivered of a child two months ago, following which she started getting high temperature and was treated as a case of puerperal sepsis, but to no effect. There was history of diarrhoea, abdominal pain and fever for five months before her pregnancy.

Twenty days after her admission on the 8th March, 1936, she was given 150 c.cm. of oxygen without exploration of the abdomen. The temperature came down to 100.6° F. next morning but rose to 103° F. in the evening, and varied from 100° F. to 102° F. afterwards. She was again oxygenated on the 15th March.

After four days her morning temperature became normal but the evening rise persisted. After the fourth oxygenation she was completely afebrile. Her pain subsided gradually. She put on eight pounds in weight when she left the hospital. The patient is still under observation with no complaints whatsoever.

*Case II.*—A Baniya female, aged 16 years, was admitted to the M. T. Hospital, Indore, on the 16th July, 1933, complaining of pain in the abdomen, occasional diarrhoea, loss of appetite and nausea, occurring nine months. Her temperature was 104.4° F. in the evening. Liver and spleen were not enlarged. Abdominal wall was slightly rigid. She was operated on on the 19th July. The abdomen was opened by a one-and-a-half-inch-long incision. The peritoneum was thickened and studded with minute tubercles. There were no adhesions. Glands were enlarged in both iliac fossae. The abdomen was closed and 200 c.cm. of oxygen were put in. Every week 300 c.cm. of oxygen were given and after four oxygenations her temperature was completely normal. Her pain subsided partly after the second oxygenation and completely after the fourth. Her weight increased by six pounds in one and a half months and she was discharged on the 28th August.

At present she is quite well and has no complaints.

*Case III.*—Female, aged 18 years, married, was admitted on 16th October, 1931, complaining of abdominal pain and occasional distension for two years. She was very constipated and had no appetite. She had medical treatment in several dispensaries in the Central Provinces. Her temperature was 100° F. in the evening. Pulse was 102 per minute on admission. The liver was palpable but not the spleen. She had amenorrhoea for the last ten months. She was explored on the 25th October, when minute tubercles were seen all over the gut, and 200 c.cm. of oxygen was put in. She was re-oxygenated every week. After the sixth one her pain disappeared and her maximum temperature was 99° F. Bowels were still constipated. She was discharged on 28th December without any complaint.

II. Many cases have been admitted for intestinal obstruction, and on opening the abdomen

most of these cases showed extensive adhesions and matting of loops of intestines. These cases were not acute to start with, but really sub-acute or chronic; later, acute symptoms followed. No surgical treatment could be done in some cases but only oxygen was introduced. The postoperative treatment consisted of fractional doses of calomel and pituitrin by injection. The obstructive symptoms passed off gradually in 48 hours. It is surprising that these cases improve remarkably well under oxygen treatment.

S., aged 26 years, was admitted for intestinal obstruction on 3rd July, 1936. The abdominal examination revealed visible peristalsis. Her temperature was 100° F. to 104° F., and pulse 110 per minute on admission. On opening her abdomen a mass of matted intestines was found on the left side below the level of the umbilicus. The peritoneum was studded with tubercles and there were dense adhesions with the coils of intestines. The abdomen was closed and 100 c.cm. of oxygen were put in. The obstructive symptoms passed off in 48 hours by the usual medical treatment. Every fifth day she was given about 200 c.cm. of oxygen. She has now improved in health and her weight has considerably increased. She gets no fever and has no constipation.

R., a Mohammedan female, aged 20 years, was admitted on 30th March, 1934, for acute intestinal obstruction. Her abdomen was opened. A tuberculous stricture near the lower end of the ileum was found. A side to side anastomosis was done. The whole peritoneum was studded with tubercles. The abdomen was closed after introducing 100 c.cm. of oxygen. Later, this was increased by 50 c.cm. each time till 400 c.cm. on the seventh sitting. After a number of oxygenations, she was treated as an out-patient. She used to be detained in the hospital for four hours after oxygenation, and then she was permitted to go home every time. She used to get pain if oxygenation was not repeated within a fortnight. The patient is now doing very well and has put on weight. Her temperature is normal and her bowels regular.

III. In ascitic cases the effect is not well marked. The oxygen appears to take a longer time to be absorbed. No exploration is necessary except when the fluid is loculated. Repeated tapplings with oxygenation through the same cannula opening have cleared up some cases.

IV. In cases with enlargement of glands in the abdomen oxygen takes a long time to reduce the size of the glands, but it does effect this in time.

### Probable mode of action

Oxygen induces hyperæmia of the whole peritoneum, as can be observed. This increased blood supply naturally helps to combat the disease.

The oxygen saturation of the tissues inhibits the growth of tubercle bacilli.

### Conclusion

There appears to be no doubt that oxygenation is an effective remedy in the treatment of abdominal tuberculosis. During the past few years I have observed in all about two hundred cases treated by this method, some of which were diagnosed by laparotomy. They have certainly improved. Most of these cases were not given any other treatment. Many of them



were very poor people who could not afford to purchase costly drugs. The effect of oxygen after laparotomy or without it appears to be equal. I think there is no reason why the abdomen should be opened up in every case when nothing radical is to be done. It should therefore be reserved for those doubtful cases where it is not safe to introduce oxygen without knowing the exact condition. I have quoted some of the cases which have improved remarkably. There are many which have been benefited partially. Lieut.-Col. Tyrrell, who has been trying the treatment for the last 16 years, does not claim that it cures the disease, but it is evident that, in a large majority of cases, oxygenation relieves the symptoms and improves the general condition and weight. The temperature subsides and pain gradually passes away. Usually six to eight oxygenations are necessary to effect relief of symptoms.

There are many cases who have not been benefited by this treatment and most of these were advanced cases or those in which the lungs were badly affected. There are many cases who left off treatment early and thus they could not be observed. A rough record of the past four years of tuberculosis of the abdomen treated by oxygenation of the peritoneal cavity in the M. T. Hospital is as follows :—

Number of cases—197.

Total number of oxygenations	..	685
Cured	..	34
Relieved	..	58
Doubtful results (did not attend)	..	64
Died or discharged otherwise	..	41

(Most of the patients were females and between 14 and 25 years of age.)

#### *Alternative methods of oxygenation*

Instead of the flasks, a Lillingston and Pearson's artificial pneumothorax apparatus can be conveniently used for the purpose.

Further, a football bladder can first be filled with oxygen from the cylinder and a pinchcock put up on the tube of the bladder. It can be removed to any place and oxygen can be introduced by connecting the bladder to the cannula through a tube. It is convenient to carry the whole apparatus but correct measuring is not possible.

(The bladder should be sterile from inside and the oxygen should be used within a day or two after filling the bladder otherwise it develops a smell from the rubber, though chemical analysis of the contained oxygen does not show any harmful impurity, such as sulphurated hydrogen, carbon dioxide or sulphur dioxide.)

I am much grateful to Lieut.-Col. J. R. J. Tyrrell, I.M.S., C.I.E., Inspector-General of Hospitals, Holkar State, Indore, who has kindly permitted me to issue this article and under whose supervision I had the opportunity of studying this subject.

#### *Note*

By J. R. J. TYRRELL, C.I.E.

LIEUTENANT-COLONEL, I.M.S.

In the above note an attempt has been made by one of my assistants, Dr. Nandlal Bordia, to draw attention to prevalence and importance of abdominal tuberculosis in this part of India and to describe measures which are being taken for the treatment of the condition.

Some ten years ago when serving in Kathiawar, my attention was drawn to the fact that the abdomen, particularly the caecal region, is one of the commonest sites of a primary tuberculous infection and that thoracic and lung infections are usually secondary to abdominal.

In the early stages such patients give very vague and indefinite symptoms and even the closest examination may fail to disclose any palpable mass or painful area in the abdomen, so previous to this time I and my colleagues in Kathiawar were accustomed to diagnose such cases as appendicitis, dyspepsia, debility, constipation, dental trouble, and in females pelvic or uterine trouble.

It was when doing abdominal operations for other conditions that I was struck by the frequency one found evidence of tuberculosis not previously suspected which led my colleagues and myself to look for these cases and to try to detect them. We found them to be quite common and that same yielded to general treatment combined with rest in bed and exposure to sun, etc. Many however would not respond so favourably and so it was decided to try the effects of oxygen intraperitoneally. The procedure followed was to make a small incision, which would admit one or two fingers, examine the abdomen, and make certain of the diagnosis. After stitching up the wound 100 to 500 c.cm. of oxygen were passed into the peritoneal cavity. After some days when the charge was absorbed and according to the general condition of the patient a further charge was introduced, but on this and subsequent occasions this was done by passing a fine trocar and cannula through the abdominal wall and introducing the oxygen through this.

The number of times this little operation had to be done depended on progress.

I was so impressed by the improvement, in even the most advanced cases of abdominal tuberculosis, some with even complete obstruction, that I continued using the same treatment on my transfer to Indore some seven or eight years ago.

When I came here, I found conditions as in Kathiawar, namely, that very few cases of abdominal tuberculosis were being recognized, but in a few months we found it to be, as in Kathiawar, by far the commonest seat of primary infection.

I am not aware whether this holds true for other parts of India, but from my experience, in two such distant and dissimilar places as Kathiawar and Indore, it leads me to suspect that it may be so. I would therefore suggest that those interested in the rapidly spreading disease of tuberculosis should particularly look for an early abdominal infection, which may be present long before the x-ray will disclose any abnormality in the chest or even before any sign can be found in the abdomen unless they are looked for very carefully.

[Note.—In view of the observations of the authors, the possibility of the intestinal route as the portal of entry of the tubercle bacillus in Western India should be further investigated. Work done in Calcutta, under the auspices of the Indian Research Fund Association, has shown that it is comparatively rare (only 5.1 per cent) and that the human tubercle bacillus is the causative organism. The authors of the present paper do not, however, adduce any evidence from autopsy material in support of their opinion.—EDITOR, I. M. G.]

## INTRA-PLEURAL PRESSURE

## INTERPRETATION OF MANOMETRIC READINGS IN THERAPEUTIC ARTIFICIAL PNEUMOTHORAX

By T. J. JOSEPH, B.A., M.B., B.S.

*Medical Superintendent, Pendra Road Sanatorium, Central Provinces; formerly of the U. M. T. Sanatorium, Arogyavaram (Madanapalle)*

IN India, artificial pneumothorax (A P) is becoming rapidly established as an indispensable adjunct to the treatment of pulmonary tuberculosis. In the induction of A P the manometric readings of intra-pleural pressure (I P P) form one of the chief guides to the operator both in induction and in dosage; so much so, that the manometer has been described as the 'heart of the apparatus' and as the 'eye of the operator'.

In this article it is proposed to give a few observations on the physiology of I P P, and its variations in health and disease, with special reference to A P. The observations are based on no less than 21,000 separate readings of I P P made in the U. M. T. Sanatorium, Arogyavaram, of which over 6,000 have been made by the author personally.

*The physiology of I P P*

It is a well-known fact that the pressure in the adult pleural cavity is negative, i.e., less than the atmospheric pressure. The pressure is more negative during inspiration, less so during expiration, but always negative. The negative pressure is equal to the elastic tension of the stretched lung. It is greater the more the lung is expanded and *vice versa*.

In the healthy expanded lung pulmonary equilibrium in the thorax is obtained by the interplay of mainly three forces:

(1) The elastic recoil of the lung inherent in the elastic fibres which so largely make up lung tissue, tending to make the lung retract or collapse towards its roots.

(2) The atmospheric pressure acting on the inner surface of the lung through the air-passages (the outer surface being protected from the atmospheric pressure by the chest wall) and tending to keep the lung expanded.

(3) The force of cohesion between the opposing surfaces of the visceral and parietal pleurae tending to prevent their separation.

It has been demonstrated experimentally that when an unopened thorax is enclosed in an airtight bell-jar and the air exhausted by means of an air-pump (thus eliminating the atmospheric pressure acting on the inside of the lungs), the lungs still remain expanded and the two layers of the pleura unseparated. This shows that the force of cohesion alone (unaided by the atmospheric pressure) is able to overcome the tendency for elastic recoil of the lungs. However, as soon as the two layers of the pleura are separated from each other by ever so small a distance, as by introducing a small quantity of air into a free

pleural cavity, the force of cohesion is immediately and completely nullified. Then if by any means atmospheric pressure is put in communication with the pleural cavities, or, in other words, the pressures inside and outside the lungs are equalized, then the elasticity of the lungs will act unopposed and the lungs will collapse. This is illustrated by the phenomenon so often seen on the post-mortem table where the lungs collapse considerably as soon as the chest wall is opened. This will also explain the fact that, with a healthy lung or with a diseased lung which is not consolidated by exudate or hard fibrous tissue or other solid tissue, no positive pressure in the pleural cavity is required to bring about a collapse of the lung.

*Measurement of intra-pleural pressure (I P P)*

The introduction and use of the water manometer in connection with the therapeutic administration of pneumothorax is attributed to Saugmann of Vejlebjerg Sanatorium, Denmark, in 1906. Since then and before, phthisiologists in different countries have used various kinds of manometers and modes of recording pressures, so that there has been a great deal of confusion in comparing results. Some have used the U-type of manometer employing mercury, bromoform and oil, glycerine and chloroform, water, etc., as the liquids, while others have used different types of aneroid manometers. Some have recorded the displacement of water in the open limb of the U-tube manometer as measuring the pressure, while others have doubled this reading in order to get the 'true' pressure. There has also been great diversity in the bore of the needles and manometer tubings used.

Manometers of great complexity have been devised for measuring intra-pleural pressure. One such is the 'ergomanometer' devised by Prof. Parodi of Italy. It is claimed that this instrument is capable of measuring, by means of four separate manœuvres, the following four factors:—

- (1) The amplitude of thoraco-diaphragmatic movement,
- (2) the power of expansion of the lung,
- (3) the strength and fixity of the mediastinum, and
- (4) the power of expiratory compression.

*Factors causing variations in I P P*

The factors which bring about variations in I P P and its measurements are: (a) those pertaining to the apparatus used and (b) those intrinsic to the patient.

*(a) Pertaining to the apparatus*

Of course it is understood that the factors which pertain to the instrument do not alter the actual I P P, but influence only the measuring and recording of it. Such factors are the fluid in the manometer, the calibration of the manometric scale, the bore of the needle and the diameter of the manometer tube.

It is now almost universally accepted that the U-tube type of manometer is to be preferred, that water is the best fluid to be used in the manometer and that the pressure is to be recorded in centimetres of water column, the total difference between the levels in the two limbs of the manometer being taken as the 'true' pressure.

It will be readily understood that the pressure in the manometer is shown as a result of an equalization of pressures between the air in the closed limb of the manometer and the connecting tube on the one hand, and the air (or absence of air) in the pleural space on the other hand. This equalization depends upon the rate of flow of air through the needle. The rate of flow of air through a capillary tube, such as a needle, depends upon its length and its bore. Physicists have established that if the length is halved the rate of flow is doubled, and if the diameter of the bore is halved the rate of flow is reduced 16 times. It will also be seen that the smaller the amount of air in the connecting tube the quicker the equilibrium above mentioned will be established and therefore the quicker and sharper the manometric response will be. The smaller the bore of the needle and the larger the volume of air in the connecting tube the less sensitive the manometer will be, and the greater will be the departure of the manometric readings from the correct value. It has also been shown, by connecting the same pleural space to manometers of different calibre, that the wider the tube the less sensitive the manometer becomes.

Therefore, from a purely mechanical point of view, the ideal arrangement would be to have a wide bore needle connected to a narrow bore manometer with as short a rubber tube as possible. However the manometer tube should not be less than about 3 mm. in diameter as otherwise surface tension and capillary force would interfere with the working of the manometer.

Recently the American Sanatorium Association appointed a committee for the standardization of the A P apparatus. This committee has now made the following recommendations :—

(1) For the manometer and connecting tube a diameter of 3 to 5 mm.; the connecting tube to be as short as is practically possible.

(2) For the pneumothorax needle 0.8 to 1.2 mm. diameter, the needle to be 2 to 2.5 inches long.

(b) *Factors intrinsic to the patient*

1. *Age*.—In the new-born infant there is hardly any negative I P P. In the eight-day-old infant the negative I P P was found by Hermann to be only 0.4 mm. of mercury (or 5.4 mm. of water). The high negative I P P observed in the adult thorax is developed gradually. It is due to the fact that the size of the thorax increases more rapidly and to a greater extent than the lungs. To fill this

enlarging cavity the elastic lungs become more and more expanded and thus the negative I P P is established. In the healthy chest the maximum negative I P P is attained when the chest has grown to its maximum size. Often in old age the negative I P P declines again on account of loss of elasticity of the lungs due to emphysema and other causes.

2. *Depth of breathing*.—During inspiration the chest cavity expands increasing the tension of the already tense elastic fibres in the lung. This shows itself in the pleural cavity as an increased negative pressure. The deeper the breathing the greater the fluctuations of the manometer. During the induction of A P it often happens that a sudden deep expiration, as when the patient coughs, the fluid in the manometer is forced out of its open end. Hence the necessity to get the patient to breathe normally and regularly before recording the readings of the manometer.

3. *Position of the patient*.—It has been found experimentally and in actual therapeutic practice that the I P P is higher (less negative) in a dorsal position than in a lateral position. Some observers have noticed a difference of as much as 10 cm. of water pressure caused by change of posture. Whether the weight of the lung plays any part in the causation of this difference is still a subject of controversy among plethysmologists.

4. *Site of puncture*.—Sisti and Cati in the Benito Mussolini Institute (now Carlo Forlanini Institute), Rome, demonstrated the difference in pressures between the upper and lower parts of the pleural cavity by introducing two needles into the same pleural cavity of a dog, one near the apex and the other near the base, and recording on a revolving drum the two intrapleural pressures simultaneously while the dog was made to breathe quick and deep. The curves obtained by them are reproduced below.

It will be noticed in the graph that the amplitude of oscillation is greater at the base than at the apex and that at the base the values approach the zero point during expiration.

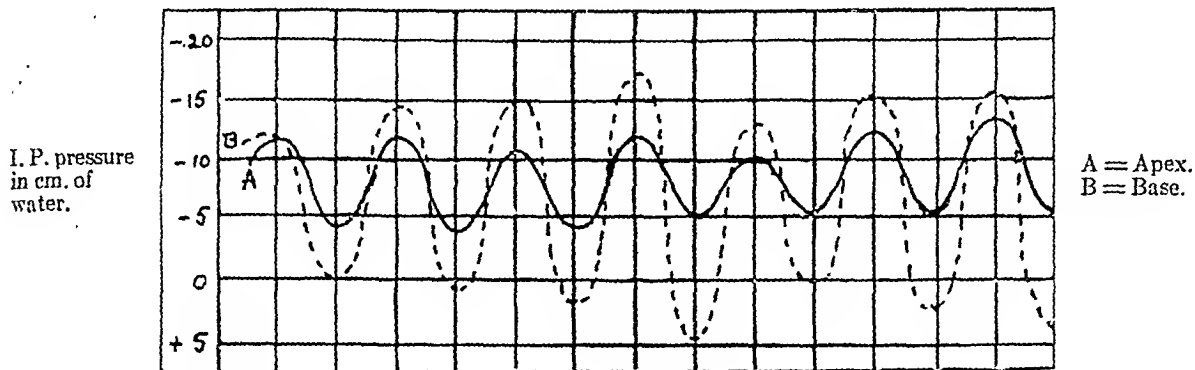
5. *Condition of the lung and pleura*.—In any condition in which the tendency for collapse inherent in the lung is increased, the pleural cavity will show an abnormally high negative pressure (for normal I P P see below). Commonest among such conditions are :

(a) *Tendency to atelectasis*.—When in any part of the lung the bronchi are blocked by disease or other causes, the air in the corresponding alveoli of the lung is absorbed and the tendency for collapse in that area becomes so great that it often causes retraction of the adjacent chest wall and displacement of the mediastinum towards the same side. The pleural cavity of such a lung, even though the atelectasis is only partial, will show a very high negative pressure, — 20, — 30, or even more, cm.

of water, and as soon as a small quantity of air is introduced and the force of cohesion between the two layers of the pleura is overcome the lung collapses quickly.

(b) *Extensive fresh fibrosis of the lung.*—Here the lung collapses more quickly even than healthy lung tissue. On the other hand, if the fibrosis is old-standing and hard, collapse is more difficult than in a normal lung.

that a yielding mediastinum moves in and out with the movement of the chest wall on the side of the A P, thus preventing great increase in the volume of the chest cavity during inspiration. (In the phenomenon called 'mediastinal flutter' which takes place in an open pneumothorax due to a large opening in the chest wall or during thoracoplasty operations, the movements of the mediastinum are the reverse of the



The above two factors, namely, the tendency to atelectasis and fresh fibrosis, are probably the chief causes of the phenomenon known to phthisiologists as 'selective collapse', or the collapse of the diseased part of a lung while its healthy part remains expanded.

When the two layers of the pleura are extensively adherent, and only small pockets of free pleural spaces are left, these free spaces are often found, contrary to expectations, to show high negative pressures. In fact some of the highest negative pressures met with in the practice of A P are in small pleural pockets where the pleural walls have become thick and unyielding due to old pleurisy. Here the high negative pressure is not due to the power of elastic recoil of the lung, but to the fact that, when air in such a pocket gets absorbed, the lung is prevented by the thick pleura from expanding and filling up the space. This pleural space is converted into a comparative vacuum with a high negative pressure. A small quantity of air introduced into this space will quickly convert this high negative pressure into a high positive one. The following two examples will illustrate this point:—

*J., girl, aged 18 years.*

7-2-36. —7—1, 100 c.c. —1+2.

A P abandoned after a second trial on 8-2-36.

*R., man, aged 35.*

5-10-35. —14—1, 300 c.c. —6+3.

7-10-35. —10+2, 300 c.c. —6+6.

13-10-35. —14+10, 300 c.c. —6+20.

(Patient breathing hard.)

Fluoroscopy revealed only a small pocket of air at the base. A P abandoned on account of ineffective collapse.

6. *Condition of the mediastinum and diaphragm.*—Where the mediastinum is very flexible and easily displaced the manometric oscillations are 'damped', i.e., smaller and more sluggish than otherwise. This is due to the fact

above and tend to asphyxiate the patient by compressing the healthy lung during inspiration.) Communication between the two pleural cavities through the mediastinum, said to be common among some lower animals, is almost unknown in human beings.

In bilateral A P even, when the pressure on one side is negative, the mediastinum may be found by fluoroscopy to be displaced far to the other side. This makes smaller refills at more frequent intervals and more frequent fluoroscopic examinations very necessary.

It is mainly the action of the diaphragm which causes the inspiratory increase of the negative pressure in the pleura. Therefore when the diaphragm is paralysed as a result of phrenic interruption this inspiratory increase in the I P P is reduced. If the diaphragm moves paradoxically this reduction will be all the more marked.

Example:—

*B. R., girl, aged 19 years. A P right side.*

(37) 26-3-36. —16—6, 300 ± 0 + 6.

(38) 27-4-36. —20—4, 400 + 6 + 12.

9-5-36. Phrenic evulsion was performed on the right side.

18-5-36. Fluoroscopic examination showed diaphragm paralysed, no effusion in A P.

(39) 28-5-36. —6—3, 100 c.c. + 2 + 4.

(40) 27-6-36. —6+1, 100 c.c. + 5 + 8.

7. *Contents of the pleura.*—Effusion into the pleural space, or escape of air into the pleura from the lungs (pleuro-pulmonary fistula), will increase the I P P and change it quickly to positive with small quantities of air. In fact, during therapeutic pneumothorax often the first sign of on-coming pleural effusion is the increase in I P P. This increase is not only due to the fluid taking up space and compressing the air but also partially due to reduced absorbing power and increased rigidity of the pleura on account of the pleurisy preceding effusion.

Often a large increase in pressure is noticed when the quantity of fluid formed is small.

*L., girl, aged 17.*

- (18) 4-5-35. — 7—2, 500 + 1 + 4.  
 20-5-35. Fluoroscopy; effusion, small quantity.  
 (19) 22-5-35. — 8—1, 150 + 5 + 8.  
 (20) 15-6-35. — 7—1, 100 + 8 + 10.  
 5-11-35. Physical examination, no effusion.  
 (27) 2-12-35. — 12—8, 300 + 1 + 6.  
 23-12-35. Fluoroscopy, — no effusion.

When a spontaneous pneumothorax is suspected, it is the practice to introduce the A P needle and note the pressure in the pleural cavity. If the hole in the visceral pleura is a valvular one admitting air into the pleural cavity during inspiration but preventing its escape during expiration, the I P P will be found to be very high, may be +20 or +30. If the hole is a large one, remaining open both during inspiration and expiration, the I P P may not be high but it will be found not to change to negative even after taking out large quantities of air. In such cases a continuous aspiration of air from the pleural cavity is indicated.

*K., man, aged 32.*

- 1-6-36. Spontaneous pneumothorax suspected. I P P — 2 + 4; after taking out 500 c.c. of air — 2 + 4. After taking out another 500 c.c. pressure same.  
 5-6-36. Patient very breathless. Pressure — 2 + 6; after taking out 1,000 c.c. of air — 2 + 5; continuous aspiration of air established.

#### *Normal intra-pleural pressure*

The factors which alter the readings of the manometer being so many and varied it is not easy to give figures which form the limits of normal I P P. According to Von Muralt (quoted by Sewall), after the initial introduction of gas into the pleural cavity free from adhesions, the manometer registers a mean average pressure of — 6 to — 8; during inspiration — 10 to — 12; during expiration — 4 to — 2; during deep inspiration up to — 20. Bunta gives the range of average I P P before inflation in uncomplicated pleura as — 7 to — 5 and MacLeod — 13.6 on inspiration and — 6.8 on expiration. Aron, quoted by Bunta, made 36 observations on a sound man and got the average tension at the end of quiet inspiration — 6.3 and at the end of quiet expiration — 4.1. At the U. M. T. Sanatorium, Arogyavaram, the average of 80 readings before the first two introductions of air in 40 cases where subsequent fluoroscopic examination showed good collapse was — 10.4 on inspiration and — 6 on expiration. All the pressures given above are in centimetres of water.

#### *Interpretation of manometric readings in artificial pneumothorax*

When a needle is introduced through the chest wall for an induction of A P the manometer might behave in various ways:—

1. *Normal movements.*—If the needle end is correctly placed between the two layers of a

free pleura and if the needle is not blocked, a pressure round about the normal given above will be registered. If the negative pressure is high enough, say up to 4 or 5 cm. of water, and the oscillations are regular and especially if the pressure remains negative both during inspiration and expiration, then it is safe to introduce air.

2. *No movements.*—The needle end may be in the chest wall, in an adherent pleura, or in a pleural effusion; or the needle may be blocked by tissues, blood or moisture in the needle.

3. *Small movements about zero.*—Sometimes the manometer oscillates round about zero showing a small negative on inspiration and a small positive on expiration. When this happens the needle end may be in the pleural cavity or in the lung. It is not advisable to introduce any air unless there is reason to believe that the needle end is in the pleural cavity. The same type of movement with a wider amplitude, say — 5 + 4, may be obtained with the needle end in a fair-sized bronchus or in a superficial cavity with an open bronchial inlet.

Suppose the reading obtained is — 3 + 3. To know whether the needle end is in the pleural cavity or not, the patient may be asked to take a deep breath and hold it. If the higher negative pressure, say — 6, produced during this inspiration remains steady while the breath is being held, the needle is probably in the pleural cavity. If the higher negative pressure produced slowly falls, the needle is in the lung, a bronchus or a pulmonary cavity. Small or sluggish movements may be caused by partial blocking of the needle.

4. *Irregular movements.*—The manometer might show a good negative without further oscillations. The needle end has probably passed through a free pleural space and touched the lung. The indication is to withdraw the needle a little and gently clear it with the stilette.

If the manometer rises on the positive side in jerks synchronous with the pulse, the needle end is in an artery. If it does so slowly without jerks the needle end is probably in a vein. (The needle when withdrawn will be found to drip blood.) In either case no air should be introduced for fear of the dread accident of air embolism. (Some have asserted that the needle end in a pulmonary vein would show a negative pressure. There is no evidence for this.)

5. *Reversed movements.*—If the movements of the manometer are reversed, i.e., more negative during expiration and less negative or slightly positive during inspiration, the needle end is probably below the diaphragm in the peritoneal cavity. 'Dragging' or slightly reversed movements can happen with the needle in the pleural cavity when the diaphragm is adherent to the chest wall, or when it is moving paradoxically due to paralysis.



6. 'Falling manometer'.—The manometer is said to fall when an initial high positive pressure slowly becomes less and less with every oscillation or actually becomes negative. This happens after admission of air into the pleural space and is due to the slow separation of slightly sticking pleural surfaces or due to the diffusion of air between adhesions or into the recesses of the pleural cavity.

#### Summary and conclusions

1. The causation and physiology of intra-pleural pressure (I P P) are discussed.
2. Factors causing variations in manometric readings during the measurement of I P P are described.
3. The recommendations of the American Sanatorium Association for the standardization of the artificial pneumothorax (A P) apparatus are discussed and summarized. The adoption of these recommendations as the standard in India would facilitate the comparison of results by different observers.
4. The interpretation of different types of manometric readings in A P and allied conditions, such as bilateral A P, A P with phrenic evulsion, spontaneous pneumothorax, etc., are discussed and illustrated.
5. The importance of a correct interpretation of manometric readings in the practice of A P is emphasized. The induction of A P without the aid of a manometer should be looked upon as 'criminal negligence' on the part of the operator.

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## TREATMENT OF TUBERCULOUS HÆMOPTYSIS BY SUBCUTANEOUS EMPHYSEMA

By U. P. BASU, M.B., F.R.C.P.I., F.S.M.F.  
Professor of Clinical Medicine (Offg.), Medical College, Calcutta

BETWEEN January 1935 and October 1936 altogether 97 cases of pulmonary tuberculosis were treated by me in the tuberculosis wards of the Calcutta Medical College Hospitals. Of these 61 were males and 36 females. Hæmoptysis was present in 46 cases—among whom 36 were males and 10 females. Initial hæmorrhage was present in 26 cases, recurrent in 9 cases, late in 8 cases and fatal in 3 cases. It is thus evident that in my series of cases a large number of patients manifested this symptom. Gonzalez de Vega and Perez (1935) reported successful treatment of tuberculous hæmoptysis by subcutaneous injection of air varying from 200 to 300 c.cm. at the posterior axillary line at the level of the 8th, 10th or 11th ribs by a pneumothorax apparatus, in a series of 4 cases. Following this line of treatment subcutaneous emphysema was produced by means of the pneumothorax apparatus in the following 5 cases with admirable result in 4 cases, the amount of air injected at a time being 250 c.cm. in each case.

#### CASE REPORTS

Case I.—S. C., Chinese male, aged 25, admitted on 4th May, 1936, with profuse hæmoptysis of five days' duration. X-ray examination revealed extensive infiltration of the left lung and early infiltration of the right sub-apical region. The sputum was positive. The patient received morphia, calcium, emetine, two intravenous injections of congo red (1 per cent), 10 c.cm. each, up to 11th May without any improvement. On 11th May all treatment was stopped and 250 c.cm. of air were injected subcutaneously into the lower part of the left chest with the result that the hæmoptysis was checked. The patient was ultimately discharged in a much improved condition on 9th October, 1936.

Case II.—S. P. S., male, aged 22, admitted on 26th January, 1936, for the treatment of fever, cough and pain on the left side of the chest. X-ray examination revealed opacity of the left chest which turned out to be an empyema. The sputum was positive. Three pints of pus were aspirated and later on partial rib resection and intermittent irrigation of the pleural cavity with Dakin's fluid were done as advised by Lieut.-Col. F. J. Anderson, F.R.C.S., I.M.S., the Professor of Clinical Surgery, Medical College Hospitals, Calcutta. Temperature subsided and the patient was much improved.

On 25th March, 1936, the patient developed chicken-pox and high fever which subsided on 13th April. The patient started profuse hæmoptysis from 7th June. He was treated with diamorphine hydrochloride, hæmostatic serum, calcium, five intravenous injections of congo red (1 per cent), 10 c.cm. each, but the hæmorrhage continued till 250 c.cm. of air were injected subcutaneously

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## PULMONARY TUBERCULOSIS AND KALA-AZAR: A FATAL COMBINATION

By L. EVERARD NAPIER, M.R.C.P. (Lond.)

*Acting Professor of Tropical Medicine.*

*(From the Calcutta School of Tropical Medicine)*

It has always been the teaching at the Calcutta School of Tropical Medicine that, in cases of kala-azar in which there is any secondary infection or disorder that demands treatment, the treatment for kala-azar should be given first. This applies particularly in the case of hookworm and other helminthic infections. We have been unconvinced by the statement found in textbooks that these helminthic infections interfere in any way with the efficacy of the specific antimony treatment, and in cases 'resistant' to treatment we have never found that the removal of the worms made the sub-

*(Continued from previous page)*

in the back; this controlled the hæmoptysis. The patient was ultimately discharged in a much improved condition on 2nd October, 1936.

*Case III.*—S. C. B., male, aged 24, admitted on 14th August, 1936, with profuse hæmoptysis of five days' duration. X-ray examination revealed infiltration and exudation of the middle and lower fields of the left lung. The sputum was positive. Treatment with morphia, calcium, and hæmostatic serum lessened the hæmoptysis in quantity in three days' time, but it again became copious whereupon subcutaneous injection of 250 c.cm. of air was given on the left side of the back of the chest; this was repeated (the same quantity) three days later, with the result that the hæmoptysis was checked.

*Case IV.*—P., male, aged 20, admitted on 8th July, 1936, with a history of slight fever, cough and recurrent hæmoptysis—the last attack being one and a half months prior to admission. X-ray examination revealed infiltration and cavitation of the sub-apical region of the right lung. The sputum was positive. On 4th August the patient started getting hæmoptysis again and was treated on the usual lines, but without any result. On 7th August 250 c.cm. of air were injected subcutaneously in the back with the result that the hæmoptysis was checked.

*Case V.*—P. K. D., female, aged 24, admitted on 28th May, 1936, for fever and hæmoptysis. The hæmoptysis dated from 12th May and persisted profusely till her admission. As she was in very low condition, no x-ray examination could be done. The sputum was positive. She was treated with diamorphine hydrochloride, calcium, hæmostatic serum and ten injections of congo red (1 per cent), 10 c.cm. each, intravenously. As these did not check the hæmorrhage, a subcutaneous injection of 250 c.cm. of air was given, which temporarily checked the hæmorrhage. Unfortunately broncho-pneumonia followed the aspiration of blood. Thenceforward the patient suffered from weekly bouts of hæmoptysis. It was not possible to inject any more air subsequently on account of the persistence of the emphysema, extremely low general condition due to broncho-pneumonia, and pain. The patient ultimately expired on 25th June, 1936.

It will thus be apparent that the subcutaneous emphysema treatment could not be fully tried in this case.

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sequent course of treatment more effective. On the other hand, after a course of antimony treatment the patient is much better able to stand the anthelmintic treatment, whereas serious collapse and even death has followed the administration of chenopodium and carbon tetrachloride in the usual doses in a debilitated kala-azar patient.

Another example is pyorrhœa; local medical treatment for this should be given, but removal of a few teeth may lead to uncontrollable hæmorrhage from the gums. Some years ago we lost two patients through over-vigorous dental treatment: having gained our experience in the first case, in the second we had issued a special warning which was ignored and six teeth removed.

We do not of course mean to imply that these concomitant infections are unimportant: on the contrary they often require vigorous treatment before the patient is restored to full health. Further, in the case of intestinal and some pulmonary complications it is advisable to give symptomatic treatment at the same time, but the specific antimony treatment should not be postponed on account of the presence of these complications, nor in order that they may be treated first. The best example of all is cancrum oris which is an indication for immediate specific treatment if the patient's life is to be saved.

There is, however, one disease in which the antimony treatment itself seems to exert a malign influence on its course, namely, pulmonary tuberculosis. We have frequently observed that, when kala-azar and pulmonary tuberculosis co-exist, antimony treatment has little or no effect on the symptoms—fever and splenic enlargement—and that, on the other hand, the lung lesions undergo rapid extension when antimony is given.

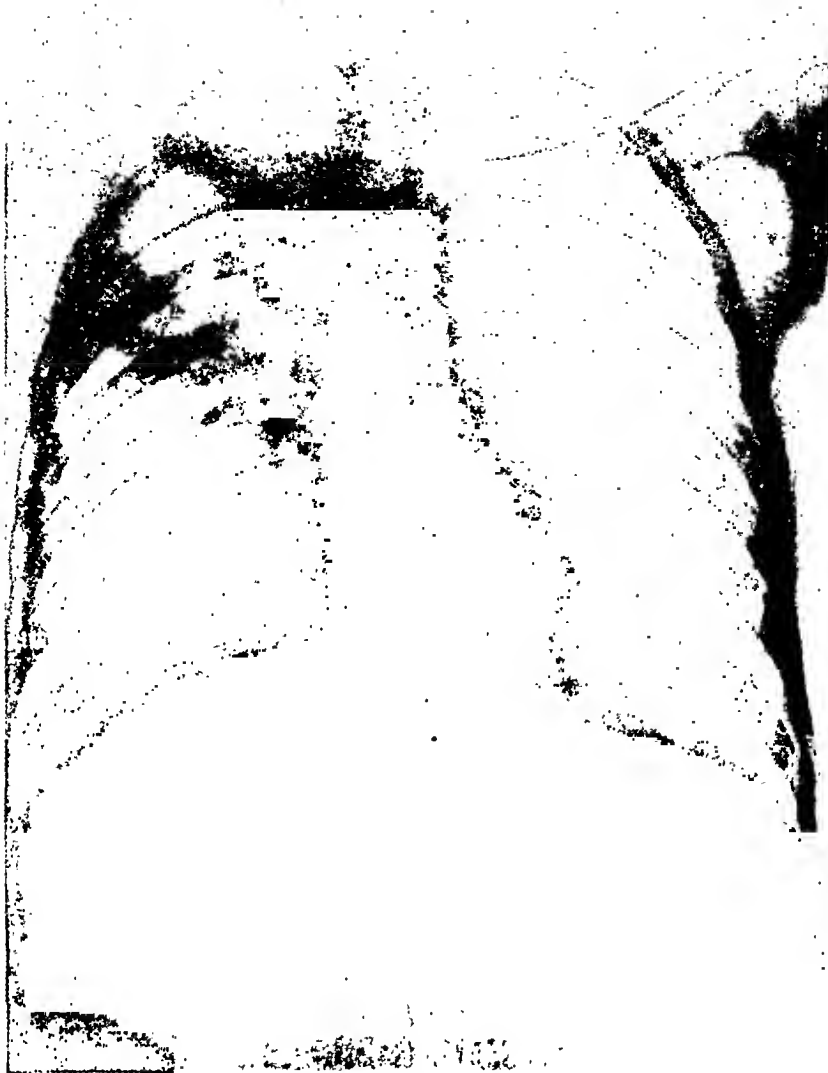
The notes on two cases are given to illustrate this point:—

*Case I.*—A. M., male, Bengali, Hindu, aged 20 years, was admitted into the hospital attached to the Calcutta School of Tropical Medicine with a history of irregular fever for two years; during this period he had been apyrexial for six months but the fever had now returned. His spleen had been enlarging gradually during the last year. He had a chronic cough and suffered from indigestion.

He was thin, weight 84 pounds, anæmic in appearance and generally debilitated. His spleen was four inches below the costal margin, and his liver was palpable. His gums were spongy and tended to bleed. Nothing abnormal was noted in his heart, except an increased rate of 108. When examining his lungs, the admitting officer noticed nothing abnormal. His temperature was of a moderately high remittent type; his respirations were 26 per minute. His aldehyde test was strongly positive. The Wassermann reaction was also positive. A spleen puncture showed the presence of leishmania.

The patient was put on to a course of neostibosan, on alternate days; the first dose was 0.15 gramme and all subsequent doses 0.25 gramme. This modified dosage was given in deference to his debilitated condition.

After the first few injections exacerbation of the lung symptoms was noticed and his lungs were re-examined.



*Case I.*



*Case II.*



Fig. 1.—Antero-posterior view.



Fig. 2.—Right oblique view.



Fig. 3.—After removal of cyst and phrenic evulsion,  
leading to recovery.

The note at the right apex was found to be dull and fine crepitant râles could be heard all over the upper lobe. The sputum was examined and tubercle bacilli found.

Meanwhile, he had received twelve injections of neostibosan—total dose 2.9 grammes. This course of injections had no effect whatsoever on his temperature which was still a remittent fever reaching 102°F. daily. His spleen appeared to be slightly reduced in size. His cough was worse and an examination of the lungs suggested that the tuberculous process was extending.

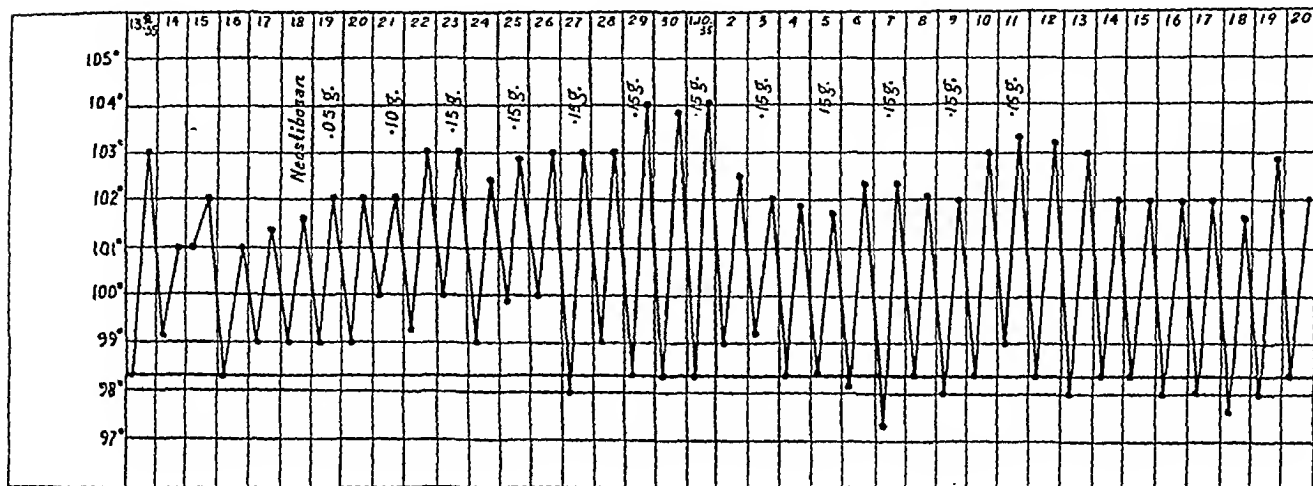
An x-ray examination of the chest (plate XVI) showed the following conditions: 'Infiltration and cavitation right upper field; right basal pleurisy'.

In both instances the antimony treatment appears to have caused an acceleration of the tuberculous process.

In the first case there is some evidence that the leishmania infection was cured, but in the second the presence of the tuberculous infection appears to have exercised an inhibitory effect on the action of antimony.

We have unfortunately no actual radiographical evidence of this rapid extension, but

CHART



#### X-ray report

A second spleen puncture was done and no leishmania was found in the smear. This suggests that the antimony had acted specifically on the leishmania infection, but had, on the other hand, lighted up the lung lesions.

Case II.—P. M., a boy, aged 7 years. He gave a history of irregular fever for six months, a cough, irregular motions, an enlarged spleen and liver, œdema of the feet, and anæmia.

Examination of the lungs showed scattered coarse râles and rhonchi over both lungs. The spleen was just palpable. His temperature was of a high intermittent type rising to 103°F., pulse 140, and respirations 28.

Laboratory examinations showed:—*Entamoeba histolytica* in the stools; Wassermann reaction—moderately positive; aldehyde test +++; and leishmania in the peripheral blood. No tubercle bacilli were found in the sputum.

He was put on neostibosan intravenously; the first dose was 0.05 gramme, the second 0.1 gramme, and subsequent doses 0.15 gramme on alternate days—a total of 1.65 grammes.

His cough became worse and examination of the chest showed scattered fine crepitant râles all over both lungs. The injections had no effect on his temperature which remained high intermittent with a single daily rise (see chart). The spleen remained just palpable.

At this point we found out that he was the brother of case I and despite the negative sputum findings we focused our attention on his chest again. The physical examination was suggestive and a skiagram (plate XVI) was taken; the report on this was as follows:—'Extensive infiltration both lungs'.

A culture of the peripheral blood showed leishmania still present.

Each patient was taken to his home and both are reported to have died within a few months.

in the first case the lung lesions were overlooked during physical examination at the time of admission, which became very obvious a few weeks later (though it is inconceivable that the extensive lesions seen in the skiagram could have developed in so short a time), and in the second the nature of the physical signs changed very rapidly. In both instances there was exacerbation of the symptoms.

There is, however, only one specific for kala-azar and so one is placed between the devil and the deep sea. Though in neither instance quoted was the usual course of daily injections given nor was the dosage the maximum dose for the age of the patient, it does seem possible that by reducing the dosage in these cases, one might cure the kala-azar without producing the unfavourable reaction. In any case this procedure would seem to offer the only chance of success, as at this stage it is probably very seldom that kala-azar undergoes spontaneous cure, and, on the other hand, it is unlikely that one could stop the tuberculous process in a patient in which the leishmania infection was active.

We have repeatedly observed this detrimental action of antimony in phthisis. These two cases illustrate this observation very well, but they were also of special interest, in that the patients were both members of the same family and were admitted into different wards in our hospital at about the same time.

## A CASE OF HYDATID CYST OF THE LUNG, WITH POST-OPERATIVE TUBERCULOUS INVOLVEMENT

By A. C. UKIL, M.B., M.S.P.E. (Paris), F.S.M.F., F.N.I.

and

S. K. GANGULI

(From the Department of Chest Diseases, Medical College Hospitals, Calcutta)

**Clinical history.**—A Hindu male, aged 32 years, a dog lover, complained of irregular low fever (99°F. to 100°F.), heaviness of the right chest and cough which increased on trying to lie down on the right side, and recurrent small hæmoptysis for three months. There was no anorexia nor emaciation. As regards previous history, it transpired that he was once treated for cervical adenitis at the age of 12 years. He was being treated for pulmonary tuberculosis by a physician outside. He came under our observation in August 1934.

**Physical examination.**—The right side of the chest showed loss of resonance from the level of the fourth rib downwards. On auscultation, nothing beyond some diminution of breath sounds was noticed. Sputum examination was repeatedly negative for tubercle bacilli.

**X-ray examination**—showed a circular opacity, with a regular margin, about the size of a tennis ball above the diaphragm, but not adherent to its surface. The left lung showed a small healed tuberculous lesion at the apex. A provisional diagnosis of hydatid cyst of the lung was made on the strength of this evidence. To confirm the provisional diagnosis, a complement-fixation test was performed at the Indian Institute for Medical Research, using the hydatid fluid from diseased sheep's liver as antigen. This proved to be strongly positive. The Wassermann reaction was negative. A differential count of blood showed an eosinophilia of 7 per cent.

On the 15th October, the patient had an acute attack of pleurisy when it was decided, in consultation with Lieut.-Col. F. J. Anderson, I.M.S., of the Medical College Hospitals, to operate on him in two stages. The first stage of the operation was done by Col. Anderson on 20th October by removing the anterior portions of the fourth and fifth ribs on the right side. The hydatid cyst was located by puncturing the cyst wall with a syringe; some fluid was taken out for microscopic examination (which showed echinococcus hooklets) and 5 c.cm. of 40 per cent formalin was injected into the cyst to kill the brood capsules and scolices. The operation was performed under local anæsthesia (novocaine 2 per cent), aided by a few whiffs of ether. The space between the visceral and parietal pleura was packed with corrugated drainage sheet to induce adhesions to form. After eight days, when it was found that the adhesions had walled off the site, the second stage of the operation was undertaken under local anæsthesia, aided by gas and oxygen. It was noticed that on account of the rise of the diaphragm after the first operation, the cyst was pushed much higher up than its original position before operation. A bloodless operation was done with the aid of the diathermy knife and the cyst (both ecto- and endo-cyst) was completely removed.

The wound healed, except for a slight discharge from the previous track of the drainage tube, at the end of one month, but a slight afternoon temperature still persisted. A skiagraphic examination showed a diminution in the size of the area covered by the cyst, but a worrying incident occurred at this stage; the sputum

showed a few tubercle bacilli. This was in February 1935. With right phrenic evulsion and gold therapy (sanocrysin), carried out at the Madanapalle Sanatorium, the tubercle bacilli disappeared from the sputum and the patient made a steady recovery. The patient has been examined since and is keeping well.

In our opinion, the tubercle bacilli detected in the sputum after the operation were probably due to the injury of a tuberculous gland near the wall of the cyst. No serious damage to lung tissue occurred, probably because of a high degree of allergy on the part of the patient and also owing to the timely compression of the affected area by phrenic exairesis.

In August 1934, Drs. Tulsi Dass and Pirthichand (*Indian Medical Gazette*, August 1934, pp. 448-449) reported a case of hydatid cyst of the lung where, thinking that they were dealing with a case of pleural effusion, anaphylactic shock occurred after aspiration and immediate operation had to be performed in a boy of 14. This was followed by recovery. We believe this is the first reported case where the cyst has been successfully removed without leakage.

The skiagrams before and after the operation are given (plate XVII, figures 1, 2 and 3).

## NOTICE

On account of shortage of space three papers which should have been included in this number have been held over and will be published in a subsequent number. The titles are given below:—

(1) A Short Note on the Diagnosis of Pulmonary Tuberculosis. By D. R. Dhar, M.B., D.T.M. (Cal.), M.R.C.P. (Lond.).

(2) Investigations into the Blood Picture, specially of Leucocytes, in Pulmonary Tuberculosis. By B. Jayaram, M.B.

(3) A Case of Pulmonary Tuberculosis, Complicated with Syphilis. By A. C. Ukil, M.B., M.S.P.E. (Paris), F.S.M.F., F.N.I.

# Indian Medical Gazette

APRIL

## THE SPECIAL TUBERCULOSIS NUMBER

THE question of starting a tuberculosis journal has often been mooted. India is a large country and the problem of tuberculosis is sufficiently important to justify an examination of that question.

There would be some advantage in collecting together, from time to time, under one cover, authoritative articles and reports of work done by specialists in this country on this vital subject, in order that they might be readily available to all tuberculosis workers who would thereby be saved the trouble of searching through a number of medical journals.

There is, on the other hand, one very great objection to such a scheme, and the same objection is applicable to the case of all specialist journals—it does collect together all papers on the subject to the advantage of the specialist who will naturally subscribe to the journal on his own subject, but it also attracts to itself articles that would otherwise be distributed in various general medical journals and it withdraws from the general practitioner the advantage of reading such articles, as the average practitioner can seldom afford more than one journal.

The distribution of a specialist journal is always limited compared with that of a journal that caters for the general practitioner. Consequently, the starting of a specialist journal, by segregating rather than disseminating papers written by specialist workers, may defeat the avowed object of such a journal, namely, the furtherance of the study of the special subject.

This was the view taken by the committee of the King George Thanksgiving (Anti-Tuberculosis) Fund when they approached us and asked if we would be prepared to publish a special tuberculosis number of the *Indian Medical Gazette*.

A special number of this kind provides all the advantages of a specialist journal to the specialist, and at the same time, as it is distributed to the four thousand regular readers of the *Gazette*, the attention of a large number of practitioners in all parts of India is drawn to the subject.

The Secretary of the King George Thanksgiving Fund, Dr. A. R. Mehta, undertook to circulate tuberculosis workers in India advising them of our intention to publish this special number. The response has been very satisfactory, almost embarrassing, and although we have excluded all other matter we have had to increase the size of the number very considerably to accommodate the articles selected for

publication, and even then at the last minute we have had to hold over one or two for subsequent numbers.

The Editor has been assisted by a small but representative editorial committee, consisting of Drs. A. C. Ukil, A. R. Mehta, C. Frimodt-Møller, and M. Kesava Pai, who have gone through all the papers submitted and have selected certain of them for publication. This committee, however, wishes it to be made quite clear that approval of these papers as suitable for publication does not necessarily carry with it approval of the principles enunciated therein. They do not wish the number to represent only their own points of view but rather those of all workers in India who by their position and achievements can be considered competent to express an authoritative opinion.

The Editor takes this opportunity of thanking the individual contributors, the Secretary of the King George Thanksgiving (Anti-Tuberculosis) Fund, the editorial committee and Dr. A. C. Ukil in particular to whom on account of his presence in Calcutta we frequently referred for important decisions, and the publishers, who have generously increased the size of the number and included a large number of illustrations without extra cost to subscribers, for making the special number the success which he feels can be claimed for it.

## THE TUBERCULOSIS PROBLEM IN INDIA

In considering the tuberculosis problem in India, perhaps one of the most important points to realize, and one that has only been fully appreciated as yet by a few workers, is that the problem is a *new* one. By this we do not mean to imply that tuberculosis is a new disease or even that it is a recent arrival in this country. Tuberculosis has claimed its victims in India for the last twenty-five centuries at least, as the disease was described by Sushruta, but even to-day it is apparently not as prevalent as it is in many western countries. Then why, it will be said, is it a major public health problem? There are two reasons; one is to be found in the word *apparently*—we do not really know the degree of infection of the population—and the second is that such evidence as exists points unequivocally to the fact that the disease is extending rapidly, and has already reached the threshold value of a public, as distinct from an individual, health problem. This much the public health authorities have in recent years been prepared to concede, and in his 1934 report the Public Health Commissioner with the Government of India says:—

'The wide distribution of tuberculosis of recent years must in a considerable measure be due to increase of urbanization and the environmental factors associated therewith, producing overcrowding and other conditions which predispose to this disease. The present position



would appear to be that, whereas our towns are heavily infected, and their residents tuberculized to some extent, the rural populations for the most part have not yet experienced the full force of the disease. If this assumption be correct, we must anticipate a much greater spread of tuberculosis among the rural population which will be facilitated by the rapidly increasing means of communications from town to village and from village to village.

Our data in regard to the incidence of tuberculosis are lamentably deficient. Only in some urban centres has it been practicable to make the disease notifiable. There is no use in introducing compulsory notification unless it can be enforced in practice, and there are many obstacles in the way, including paucity of qualified medical practitioners, the *purdah* system, ingrained prejudice against hospitals, and the tendency to conceal disease until the development of symptoms make concealment no longer possible. Generally speaking, the population of India is highly susceptible to tuberculosis and among most of them the disease takes a virulent form and runs a rapid course. Public health officers may well sigh in despair of tackling this vast problem satisfactorily within the life-time of the present generation. Environmental sanitation in India is definitely backward, and in particular the housing problem is exceedingly difficult. Many urban areas have bad or indifferent building by-laws and these, such as they are, tend to be inadequately enforced. We are witnessing to-day in many towns the creation, year by year, of housing conditions favourable to the rapid spread of tuberculosis. Until this problem is dealt with, we shall continue to create new slums within our towns and to add to the magnitude of the tuberculosis problem. First and foremost, the problem resolves itself into one of improving housing in urban areas with all that this connotes in the way of space, sunlight and fresh air. To tackle the problem from any other aspect than this is to begin at the wrong end. It is beyond the financial resources of the country to build hospitals and sanatoria to house our countless cases of tuberculosis, unless we can reduce markedly the number of fresh cases infected each year, by improvement of environmental conditions. Energetic propaganda is therefore required, particularly among the members of municipal committees and the like, to impress upon them the importance of improved housing in their towns and the provision of parks and playgrounds.

The importance of good nutrition in the prevention of tuberculosis cannot be overstressed. This however is a problem by itself. Here it may only be noted that there is evidence of increased attention being paid to this vitally important subject.

Last year the Director-General, Indian Medical Service (Sir John Megaw), on the basis of data collected by him from medical officers and others throughout India, reported that there are probably two million cases of tuberculosis in India.

There are two main factors in any disease—the seed and the soil; except that the proportion between the human and bovine types is not the same, the seed—as far as we know, but even then there is room for more knowledge—is much the same as in other countries, but the soil is entirely different from that anywhere in the world. The whole problem is therefore quite outside past human experience and is consequently an entirely new one.

It may be claimed that most of the conditions existent in India also exist in other countries, and it is true that each individual factor governing the epidemiology is not peculiar to India, for example, the climates that are found here are also found in other countries, there are

other countries in which the population has an equally low nutritional status and where the majority sleep huddled together in small and ill-ventilated dwellings, where the proportion between the urban and the country populations is the same, and is moving in the same direction at the same rate with the advance of industrialization, where aboriginal populations mix with civilized populations, and where above all the economic question overshadows everything. But nowhere else in the world do these factors come into play in exactly the same way as they do in India, as a whole or in its numerous parts. Therefore, knowledge gained in other countries must be applied here with the utmost caution, until by scientific investigation it has been shown that the same epidemiological state does actually exist, and we must not assume that, because one set of environmental factors led to a certain state of affairs in Massachusetts, they will do the same in Mandalay.

Well-planned and standardized epidemiological surveys, and clinical, pathological and bacteriological investigations in different parts of the country are essential if we are to gain this knowledge, and, with all the attention that is being focused on this tuberculosis problem, there is little evidence that this fact is fully appreciated.

The public demand sanatoria and dispensaries where their children, their brothers and their cousins can be sent for treatment, the public-health authorities demand health visitors to seek out the patients in their homes, education and propaganda, and regulations to enforce notification and isolation, to prevent overcrowding and bad housing, to improve the food supply, and prevent the sale of infected milk. These are all excellent in their way—sanatoria and dispensaries are essentials, but if the whole revenue of the country were spent in building and running them we should still not have solved the tuberculosis problem; education and propaganda are probably the most valuable of all means of combating the disease, but are we sure that we know exactly what to teach the people; and laws and regulations are also necessary, but are liable to be translated too literally from those of other countries where conditions are different and again we come back to the necessity for exact knowledge in matters on which we are only guessing.

The position can be summarized by saying that though both medical relief and direct preventive measures are essential in an anti-tuberculosis campaign—in this or in any other country—in this country in particular organized research, both in the field and in the laboratory, must be included in any comprehensive and progressive scheme for tuberculosis control.

L. E. N.

## KING GEORGE THANKSGIVING (ANTI-TUBERCULOSIS) FUND

### HISTORY

Ours is a country where things move rather slowly and the setting up of a voluntary national organization to fight tuberculosis proved no exception to the rule. It was nearly a generation ago in 1910 that Sir Pardey Lukis, the then Director-General of Indian Medical Service, addressed the Government of India and stressed the need for a concerted action to fight tuberculosis. In 1914-16 as a direct outcome of the resolutions of the All-India Sanitary Conferences, Dr. Lancaster was specially deputed by the Indian Research Fund Association to investigate if the increase in tuberculosis was real or apparent. He visited all the provinces and nearly all the big cities and formed the view that tuberculosis was on the increase in India. The account of his tour and the reasons for his opinion are published in a large volume.

Major-General Sir John Megaw wrote in 1933 'Tuberculosis is well known to be exceedingly prevalent in the cities and large towns. The disease is increasing steadily, and rather rapidly ..... The estimate of just over two million cases of tuberculosis in India as a whole is probably much too low. .... Every large town is known to be very heavily infected'. Twenty years ago Dr. Lancaster came to the conclusion that the best chance of success lay in establishing a closer co-operation between Government enterprise and voluntary effort. He suggested the formation of an all-India anti-tuberculosis association.

In 1927, Lord Irwin, the Viceroy and Governor-General of India, realized the gravity of the problem and wished to form a central organization to give the required lead to the country on the lines of the National Association for Prevention of Tuberculosis in Great Britain. However, on account of the political situation and financial depression he deferred a nationwide appeal to a more opportune time.

The opportunity for setting up a central organization came in 1929 when the merits of the various schemes submitted for utilization of the King George Thanksgiving Fund, which amounted to Rs. 9,50,000, were considered. After the fullest consideration the advisory committee formed for the purpose recommended that an anti-tuberculosis scheme was one that was most likely to be of real service to India. It was the result of this that the King George Thanksgiving Fund Anti-Tuberculosis Committee was formed and the central office established in 1931.

### PROGRAMME OF WORK AND ACTIVITIES

The tuberculosis problem is not only a medical but a social problem as well. Hence the anti-tuberculosis campaign resolves itself into—

(1) The removal of ignorance by education of the public in the causes and prevention of the disease.

(2) Improvement in the conditions of living, e.g., town planning, better housing, sanitary improvements, etc.

(3) The removal of certain social customs and vices.

(4) The provision of tuberculosis dispensaries for early diagnosis of cases, contacts, etc.

(5) Establishment of sanatoria, hospitals, preventoria, colonies, etc.

If we had unlimited resources and powers we could undertake all the above measures. But the annual income is about Rs. 53,000 and consequently the activities have to be extremely restricted.

One thing realized right from the beginning was that for a long time hospitals and sanatoria attracted most if not all the attention of the public and the authorities to the exclusion of other measures. There is no doubt that these institutions serve a very useful purpose by—

(1) Arresting and curing the disease.

(2) Teaching the hygienic mode of living.

(3) Segregating the source of infection.

But whatever the achievements and advances made in the surgical and medical treatment of tuberculosis sanatoria cannot solve the problem. Their work for the individual is admirable. They give him a better chance of life, but from the social standpoint this work will always be incomplete. Treatment plays an important part, but the salvation of the community lies in prevention.

Practically all the activities of the Fund are directed towards prevention of tuberculosis. We have set ourselves to organize anti-tuberculosis committees in the provinces as well as in the Indian states, to educate the people about causes and prevention of tuberculosis and to create a public conscience so that efforts may be made in all directions to fight the disease.

We have now 16 anti-tuberculosis committees in the country. These committees include public-spirited men and women of all shades of opinion, members of the education and public-health departments and non-officials interested in the welfare of the people in general and in the anti-tuberculosis campaign in particular.

The chief aim of the Fund is to organize an educational campaign and with this end in view we prepare and publish suitable material for distribution and utilization by various agencies and departments engaged in the prevention and control of tuberculosis. We have now a very large amount of propaganda material in the shape of charts, posters, leaflets, films, slides, etc.

Our three series of picture posters on 'Causes, Prevention, and Signs and Symptoms' are extremely attractive and instructive. We have several films on tuberculosis with Urdu and

Hindi titles which have been exhibited at a large number of places in various provinces and stalls. A propaganda cinema lorry has been fitted up at headquarters, which has done extensive touring in the North West Frontier Province, the Punjab and the United Provinces.

The propaganda and educational campaign should be a sustained one and should go side by side with the establishment of either special tuberculosis hospitals or tuberculosis wards attached to the existing hospitals. These serve a very useful purpose not only from the treatment point of view but also for segregating tuberculous cases who are the sources of infection. But, no tuberculosis scheme can be complete without the establishment of tuberculosis clinics and dispensaries.

A tuberculosis dispensary is a specialized institution, the foundation of tuberculosis work. It is perhaps a misnomer as the word presupposes a place for doling out medicines. It is here that the patients are examined, the disease diagnosed and advice given. It is from the dispensary that the homes are visited, contacts are examined and cases are discovered. Its main function is education and epidemiological survey, and its essential agents are the doctor and the health visitors. The Fund committee helps to start such dispensaries and I am glad to record that the value of tuberculosis dispensaries is being realized and the Governments of

Bombay, Central Provinces and Bihar are going to set up such clinics in many of their big towns.

I do not propose to go into the details of many other activities of the Fund, *e.g.*, our relations with the International Union against Tuberculosis, securing of foreign scholarships, surveys conducted by its help, etc., which can be seen from our annual reports that are published each year.

The Fund has completed its five years' existence and against many odds and handicaps has proved its usefulness.

It has been able to focus the attention of the public and the authorities who are beginning to realize tuberculosis as a major public-health problem.

I sincerely hope that the Fund one day will blossom into a full-fledged national association free to expand its activities and take its rightful place alongside other independent national tuberculosis associations, *e.g.*, in U. S. A., Great Britain, France, Germany, etc.

These associations are recognized by their respective governments as being of great utility. The State endows them with the status of incorporated and registered societies and even delegates its powers to them and the day may not be far when there may be a national insurance against tuberculosis.

A. R. MEHTA.

## Medical News

### POST-GRADUATE COURSES UNDER THE AUSPICES OF THE KING GEORGE THANKSGIVING (ANTI-TUBERCULOSIS) FUND

ONE hears lamentations from medical superintendents of various sanatoria and from other experts that the vast majority of tuberculosis cases that go to them are in an advanced stage of the disease. Tuberculosis is no longer considered an incurable disease. Cases diagnosed early can be adequately treated and the disease arrested. The failure of the young practitioner to diagnose the disease may be attributed partly to the defect in the medical curricula where more attention is devoted to diseases like plague, cholera and smallpox, which even put together are responsible for fewer deaths than tuberculosis. Not only that enough importance is not given to the diagnosis and treatment of tuberculosis, but the causes and prevention of tuberculosis also are neglected. Moreover, the facilities for seeing special work in tuberculosis exist in sanatoria which are well away from the teaching institutions and it is thus that some of our young physicians who are the ones with whom the tuberculous cases first come in contact are not well equipped to help in the fight against tuberculosis. This was realized by the King George Thanksgiving (Anti-Tuberculosis) Fund and efforts have been made to organize intensive post-graduate courses at important centres. So far three such courses have been held in Calcutta where the best facilities for such training exist. These courses have been held at the All-India Institute of Hygiene and Public Health, Calcutta, with the full support and co-operation of the authorities of the Institute, the Medical College, Calcutta, and the Tuberculosis Association of Bengal to whom our thanks are due. The classes are limited to

25 candidates only as this is considered to be the maximum number that can be handled effectively for demonstration and clinical purposes. In selecting candidates various points are kept in view, such as age, qualifications, past experience in tuberculosis, and facilities for tuberculosis work after training, which is based on the recommending authorities; territorial distribution is also kept in view and our classes have included candidates from nearly all the provinces of British India and important Indian states.

For the last post-graduate course we received as many as 213 applications and the course was organized from 4th to the 29th January, 1937. The programme is given below in detail, which will show that within the period of a month as much knowledge of diagnosis, prevention and treatment of tuberculosis is given as is possible.

### KING GEORGE THANKSGIVING (ANTI-TUBERCULOSIS) FUND (Indian Red Cross Society)

*Programme of lectures and demonstrations for the post-graduate course in tuberculosis—3rd session, Calcutta, 4th to 29th January, 1937*

Monday, 4th January. Welcome by Dr. A. R. Mehta at All-India Institute of Hygiene at 10 a.m. Opening address (The tuberculosis problem in India) by Dr. Sir Nilratan Sircar at All-India Institute of Hygiene at 10-15 a.m. King George Thanksgiving Fund, its history organization, functions, etc., by Dr. A. R. Mehta at All-India Institute of Hygiene at 11 a.m. Tubercle bacillus (lecture and laboratory work) by Dr. K. V. Krishnan at All-India Institute of Hygiene at 2 to 4 p.m.

Tuesday, 5th January. Epidemiology of tuberculosis, with special reference to India by Dr. A. C. Ukil at All-India Institute of Hygiene at 10 to 12 a.m. Pathology of tuberculosis, including portals of entry of the tubercle bacillus by Dr. K. V. Krishnan at All-India Institute of Hygiene at 2 to 4 p.m.

Wednesday, 6th January. Tuberculosis in infancy and childhood by Dr. A. C. Ukil at All-India Institute of Hygiene at 9 to 10 a.m. Demonstration and examination of cases (childhood type) by Dr. A. C. Ukil at Chest Department, Medical College Hospital, at 10 to 12 a.m. Pathology of tuberculosis (demonstration) by Dr. P. K. Sen at All-India Institute of Hygiene at 2 to 4 p.m.

Thursday, 7th January. Pulmonary tuberculosis in the adult by Dr. A. C. Ukil at All-India Institute of Hygiene at 9 to 10 a.m. Demonstration and examination of cases (adult type) by Dr. N. Mukerjee at Chest Department, Medical College Hospital, at 10 to 12 a.m. Laboratory methods in diagnosis and prognosis of tuberculosis (demonstration) by Dr. K. V. Krishnan at All-India Institute of Hygiene at 2 to 4 p.m.

Friday, 8th January. Pulmonary tuberculosis in the adult (contd.), by Dr. A. C. Ukil at Chest Department, Medical College Hospital, at 9 to 10 a.m. The interpretation of lung radiograms by Dr. A. C. Ukil at Chest Department, Medical College Hospital, at 10 to 12 a.m. Administrative and preventive aspects of tuberculosis and the organization of anti-tuberculosis work by Dr. A. R. Mehta at All-India Institute of Hygiene at 2 to 4 p.m.

Saturday, 9th January. Miliary tuberculosis by Dr. A. C. Ukil at All-India Institute of Hygiene at 9 to 10 a.m. Demonstration and examination of cases by Dr. N. Mukerjee at Chest Department, Medical College Hospital, at 10 to 12 a.m. Artificial pneumothorax rationale by Dr. K. N. De at All-India Institute of Hygiene at 2 to 4 p.m.

Monday, 11th January. Certain complications of pulmonary tuberculosis (contra-lateral lesion, hæmoptysis, pleural effusion, spontaneous pneumothorax, laryngitis, enteritis, diabetes, pregnancy) by Dr. A. C. Ukil at Chest Department, Medical College Hospital, at 9 to 11 a.m. Demonstration and examination of cases by Dr. A. C. Ukil at Chest Department, Medical College Hospital, at 11 to 12 a.m. Allergy and immunity in tuberculosis by Dr. A. C. Ukil at All-India Institute of Hygiene at 2 to 3 p.m. Microscopic demonstrations by Dr. Guha Thakurta at All-India Institute of Hygiene at 3 to 4 p.m.

Tuesday, 12th January. Differential diagnosis of pulmonary tuberculosis by Lieut.-Col. E. H. Vere Hodge at Lecture Gallery, Medical College Hospital, at 9 to 10-30 a.m. The value of radiology in the diagnosis of lung diseases by Dr. S. G. Galstaun at X-ray Department, Medical College Hospital, at 10-30 to 12 a.m. The rôle of general practitioner in the control of tuberculosis by Dr. A. R. Mehta at All-India Institute of Hygiene at 2 to 3 p.m. Tutorial talk by Dr. A. R. Mehta at All-India Institute of Hygiene at 3 to 4 p.m.

Wednesday, 13th January. Climate in tuberculosis by Dr. A. R. Mehta at All-India Institute of Hygiene at 9 to 10 a.m. Routine treatment at a dispensary clinic at Chest Department, Medical College Hospital, at 10 to 12 a.m. Tutorial talk by Dr. A. C. Ukil at All-India Institute of Hygiene at 2 to 4 p.m.

Thursday, 14th January. Operation of thoracoplasty—its applications and technique by Lieut.-Col. F. J. Anderson at P. W. Hospital at 10 to 12 a.m. The treatment of certain complications of pulmonary tuberculosis (hæmoptysis, pleural effusion, spontaneous pneumothorax, laryngitis, enteritis, diabetes, pregnancy) by Dr. A. C. Ukil at All-India Institute of Hygiene at 2 to 4 p.m.

Friday, 15th January. Heliotherapy in the treatment of tuberculosis by Dr. A. C. Ukil at All-India Institute of Hygiene at 9 to 10 a.m. The treatment of certain complications of pulmonary tuberculosis (hæmoptysis, pleural effusion, spontaneous pneumothorax, laryngitis, enteritis, diabetes, pregnancy) by Dr. A. C. Ukil at Chest Department, Medical College

Hospital, at 10 to 11 a.m. Bronchoscopic drainage by Dr. S. Roy at Ear, Nose and Throat Department, Medical College, at 11 to 12 a.m. Tuberculosis survey and the arranging of statistical material by Dr. R. B. Lal at All-India Institute of Hygiene at 2 to 4 p.m.

Saturday, 16th January. Demonstration in the tuberculosis ward, Medical College Hospital, by Lieut.-Col. E. H. Vere Hodge at Medical College Hospital at 9 to 10 a.m. Demonstration and examination of cases by Dr. N. Mukerjee, Chest Department, Medical College Hospital, at 10-30 to 12 a.m. Tutorial talk by Dr. P. K. Sen at All-India Institute of Hygiene at 2 to 4 p.m.

Monday, 18th January. Differential diagnosis of chest diseases through radiogram by Dr. K. P. Sen at All-India Institute of Hygiene at 9 to 10 a.m. Demonstration and examination of cases at Chest Department, Medical College Hospital, at 10 to 12 a.m. Rationale of phrenic evulsion by Dr. K. N. De at All-India Institute of Hygiene at 2 to 4 p.m.

Tuesday, 19th January. Tuberculosis of lymph glands, bones and joints, skin and organs of special sense and methods of immobilization by splints, plasters, etc., by Lieut.-Col. F. J. Anderson at P. W. Hospital at 9 to 11 a.m. Organization of anti-tuberculosis dispensary by Dr. Mrs. C. O. Remfry at P. W. Hospital at 2-30 p.m.

Wednesday, 20th January. Dispensary routine conducted by Drs. J. N. Mitra and S. Mazumdar at various dispensaries of T. A. B. at 9 to 11 a.m. Dispensary registers and records conducted by Drs. J. N. Mitra and S. Mazumdar at various dispensaries of T. A. B. at 3 p.m. Health visits with tuberculosis health visitors conducted by Drs. J. N. Mitra and S. Mazumdar at various dispensaries of T. A. B. at 4 to 6 p.m.

Thursday, 21st January. Non-tuberculous conditions simulating pulmonary tuberculosis by Dr. N. Mukerjee at Chest Department, Medical College Hospital, at 9 to 10 a.m. Operation of phrenic evulsion by Dr. P. Chatterjee at Operation Theatre, Medical College Hospital, at 10 to 12 a.m. The rôle of the health visitors in the prevention of tuberculosis, his training and equipment by Dr. Mrs. C. O. Remfry at All-India Institute of Hygiene at 3 p.m. Health visits with tuberculosis health visitors by Drs. J. N. Mitra and S. Mazumdar at 4 to 6 p.m.

Friday, 22nd January. Demonstrations at the Jadabpur Tuberculosis Hospital by Visiting Staff of the Hospital at Jadabpur, East Bengal Railway, at 9 to 12 a.m. and at 2 to 4 p.m.

Saturday, 23rd January. Demonstrations at the Jadabpur Tuberculosis Hospital at 8 to 12 a.m. and at 3 to 4 p.m. Tea party at Jadabpur, East Bengal Railway, at 4-30 p.m.

Monday, 25th January. The state and tuberculosis from the public health point of view by Dr. K. V. Krishnan at All-India Institute of Hygiene at 9 to 10 a.m. General principles of sanatorium treatment, including selection of cases, grading of exercises and after care by Dr. C. Frimodt-Møller at All-India Institute of Hygiene at 10 to 12 a.m. The position of medical treatment in pulmonary tuberculosis by Dr. C. Frimodt-Møller at All-India Institute of Hygiene at 2 to 4 p.m.

Tuesday, 26th January. Surgical treatment of pulmonary tuberculosis by Dr. C. Frimodt-Møller at All-India Institute of Hygiene at 9 to 10-30 a.m. Indications for and technique of lipiodol diagnosis in lung diseases by Dr. K. N. De at Chest Department, Medical College Hospital, at 10-30 to 12 a.m. Surgical treatment of pulmonary tuberculosis (contd.), by Dr. C. Frimodt-Møller at All-India Institute of Hygiene at 2 to 4 p.m.

Wednesday, 27th January. Results of sanatorium treatment in India, including after-histories by Dr. C. Frimodt-Møller at All-India Institute of Hygiene at 9 to 10 a.m. Physical methods in the treatment of tuberculous diseases by Dr. S. G. Galstaun at X-ray Department, Medical College Hospital, at 10 to 12 a.m. Prognosis in pulmonary tuberculosis by Dr. C. Frimodt-Møller at All-India Institute of Hygiene at 2 to 4 p.m.

Thursday, 28th January. Classification and charting of pulmonary tuberculosis by Dr. C. Frimodt-Møller at All-India Institute of Hygiene at 9 to 10 a.m. The choice of a method of treatment for pulmonary tuberculosis (a recapitulation) by Dr. C. Frimodt-Møller at All-India Institute of Hygiene at 10 to 11 a.m. The place of village settlements in the anti-tuberculosis campaign by Dr. A. C. Ukil at All-India Institute of Hygiene at 2 to 3-30 p.m. Group photo, All-India Institute of Hygiene, at 4 p.m.

Friday, 29th January. Demonstration and examination of cases by Dr. A. C. Ukil at Chest Department, Medical College Hospital, at 9 to 12 a.m. Tutorial talk at All-India Institute of Hygiene at 2 to 4 p.m.

Time may not be very far when this course could be expanded into a full diploma course but for such an ambitious scheme adequate staff will be required. Moreover, we cannot expect candidates to come forward for the diploma course unless and until opportunities are offered by various local bodies to avail themselves of such trained people.

A. R. MEHTA,  
Organizing Secretary,  
King George Thanksgiving (Anti-  
Tuberculosis) Fund.

### INTERNATIONAL UNION AGAINST TUBERCULOSIS

THE executive committee of the International Union against Tuberculosis, General Secretary Professor Fernand Bezancon, met in Paris on 9th January, 1937, at 2-30 p.m. The main object of this meeting was to come to a decision concerning the date of the tenth conference of the International Union which should have taken place in Lisbon in September 1936 under the chairmanship of Professor Lopo de Carvalho and which, owing to unforeseen circumstances, had to be adjourned.

It was agreed that the tenth conference should take place in September 1937, either at the beginning of the month, should it be possible to meet in Lisbon, or at a date to be decided later should the conference have to be held in another city.

In their wish to pay due regard to the active and intelligent endeavours of their Portuguese colleagues who, under normal conditions, would have been entitled to expect a most successful meeting, the members of the committee expressed the hope that the conference could take place in Lisbon next September, the final decision to be taken only towards the end of April or the beginning of May 1937.

The executive committee, on the other hand, decided that the eleventh conference of the International Union against Tuberculosis should meet in 1939, instead of 1938, in Berlin, subject to the statutory approbation of the next general assembly of the union.

The members of the committee were unanimous in expressing their gratitude to the Italian Government for having placed at the committee's disposal six scholarships at the Carlo Forlanini Institute in Rome.

They approved the Regulations of the Léon Bernard Memorial Fund according to which a prize shall be awarded every other year by the executive committee to the author of an essay on tuberculosis from a social point of view, written in French or in English.

Finally it was decided that the secretariat of the union would ask the councillor members in the different countries to select certain scientific questions which would be proposed for research and which might eventually be inscribed on the agenda of future conferences of the union.

### THE WILLIAM GIBSON RESEARCH SCHOLARSHIP FOR MEDICAL WOMEN

MISS MAUD MARGARET GIBSON has placed in the hands of the Royal Society of Medicine a sum of money

sufficient to provide a scholarship of the yearly value of £292, in memory of her father, the late Mr. William Gibson of Melbourne, Australia. The scholarship is awarded from time to time by the society to qualified medical women who are subjects of the British Empire; and is tenable for a period of two years, but may in special circumstances be extended to a third year. The next award will be made in June 1937.

In choosing a scholar, the society will be guided in its choice either by research work already done by her, or by research work which she contemplates. The scholar shall be free to travel at her own will for the purpose of the research she has undertaken.

There is no competitive examination, nor need a thesis or other work for publication or otherwise be submitted. The society has power at any time to terminate the grant if it has reason to be dissatisfied with the work or conduct of the scholar.

Applications should be accompanied by a statement of professional training, degrees or diplomas, and of appointments, together with a schedule of the proposed research. Applications must be accompanied by testimonials, one as to academical or professional status, and one as to general character. Envelopes containing applications, etc., should be marked on top left-hand corner 'William Gibson Research Scholarship' and should be addressed to Mr. G. R. Edwards, Secretary, Royal Society of Medicine, 1, Wimpole Street, London, W.1, and be received not later than Tuesday, 1st June, 1937.

### INDIAN MEDICAL COUNCIL

MAJOR-GENERAL SIR F. P. CONNOR, *Kt.*, D.S.O., F.R.C.S. (Eng.), D.T.M. & H. (Eng.), L.R.C.P. (Lond.), K.H.S., I.M.S., Surgeon-General with the Government of Madras, has been duly nominated by the Government of Madras, under clause (a) of sub-section (1) of section 3 of the Indian Medical Council Act, 1933 (XXVII of 1933), as a member of the Medical Council of India, *vice* Lieut.-Colonel C. Newcomb, I.M.S., resigned.

In pursuance of the proviso to sub-section (2) of section 3 of the Indian Medical Council Act, 1933 (XXVII of 1933), the Governor-General in Council is pleased to nominate Major-General E. W. C. Bradfield, C.I.E., O.B.E., M.B., B.S. (Lond.), F.R.C.S. (Edin.), K.H.S., I.M.S., as President of the Medical Council of India with effect from the afternoon of the 13th February, 1937, *vice* Major-General Sir C. A. Sprawson resigned.

Lieut.-Colonel W. E. R. Dimond, L.R.C.P. & L.R.C.S. (Irel.), D.P.H. (Dub.), L.M. (Dub.), I.M.S., Assistant Director of Public Health, North-West Frontier Province, has been duly nominated by the Government of the North-West Frontier Province, under clause (a) of sub-section (1) of section 3 of the Indian Medical Council Act, 1933 (XXVII of 1933), as a member of the Medical Council of India, *vice* Colonel H. H. Thorburn deceased.

### DELHI ANTI-MOSQUITO CAMPAIGN

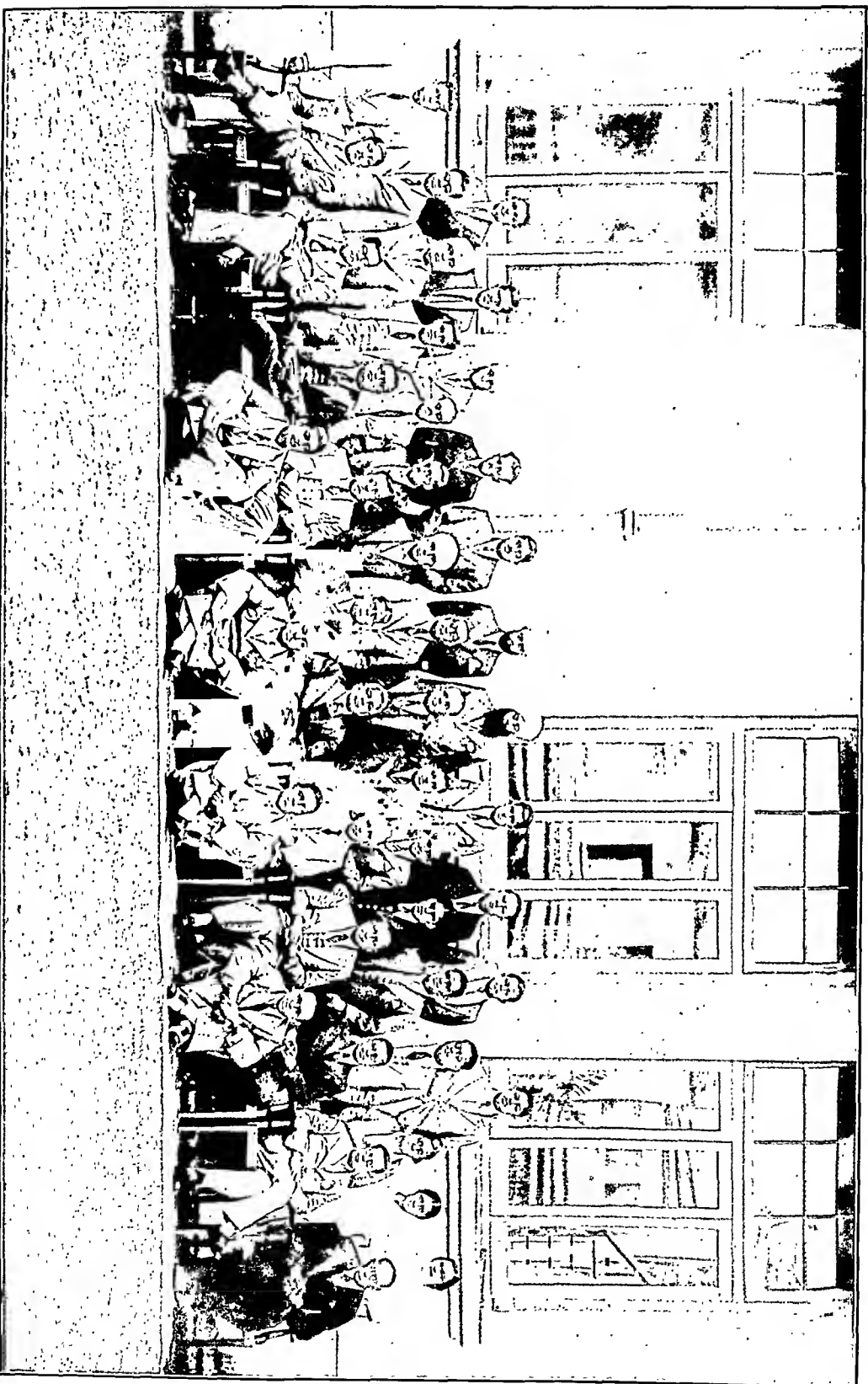
#### THE SPRING MOSQUITO NUISANCE

EVERY year, during the early spring, there is throughout northern India an enormous increase in the number of culicine mosquitoes, commencing, as a rule, towards the end of March, reaching its greatest height in April, and dying away in May. Although they are harmless as regards the spread of malaria, these insects constitute a very real pest. In the worst years the plague is so bad that whenever an almirah is opened or a curtain shaken, a cloud of mosquitoes emerges.

The mosquito concerned breeds in any kind of stagnant water, whether clean or foul, favourite breeding places being stormwater drains with their catch-pits, sullage pits, disused wells, water in disused tins, earthenware pots, barrels, garden tanks and receptacles



POST-GRADUATE COURSE IN TUBERCULOSIS  
KING GEORGE THANKSGIVING (ANTI-TUBERCULOSIS) FUND, 1937







of all kinds, sump-pits, quarry pits, water used in building construction, borrowpits, etc. It will breed in the cisterns and pans of water closets, and in the taps of bath-rooms, whenever these are not in daily use. When suitable breeding places are available, larvae are produced in enormous numbers so that a single small collection of water may produce many thousands of mosquitoes.

Unless the greatest care is taken, not only by the anti-mosquito staff but also by householders themselves, an annual recrudescence of the spring mosquito nuisance, in greater or less degree, is inevitable.

The public are invited to co-operate in the campaign by seeing that their cisterns and wells are mosquito-proof, that hydrants are not leaking, that anti-formicas, drains and gully traps are treated with phenyle solution twice a week, and that no receptacles which may hold water are left about on the roof or in the compound, either on the ground or suspended from trees. All broken ground in compounds should be levelled, and all rank vegetation removed.

A cheap and efficient anti-mosquito spray and an anti-mosquito pomade which is effective for several hours, are available at the Municipal Health Offices.

G. COVELL,

LIEUTENANT-COLONEL, I.M.S.

Director, Malaria Survey of India.

### THE EPIDEMIC OF INFLUENZA

AN examination of the five numbers of the *Weekly Epidemiological Record* issued by the Health Section of the League of Nations Secretariat since the new year reveals the fact that while the epidemic of influenza in countries of Western Europe has been of fairly wide prevalence, it has been, with the exception of a few isolated cases, of a mild character. Mortality has at no time become more serious than that resulting from the 1932-33 epidemic; it cannot be compared with the gravity of the 1918-19 epidemic.

The present epidemic was first observed in the United States of America almost a month earlier than the appearance of epidemics in recent years. Here cases multiplied rapidly without, however, resulting in a serious rise in mortality. Toward the latter part of November and until the middle of December this 'benign' or mild form of the disease spread throughout North-Western Europe—in Germany, Czechoslovakia, the Netherlands and Denmark. Here the maximum rate of increase in mortality was reached in the third week of December, after which the rate diminished.

In Germany the greatest number of deaths from influenza was recorded in Berlin. Between 15th November and 19th December the general mortality rate reported weekly was 12.2, 14.2, 17.9, 20.1, and 20.7 per 1,000 inhabitants. Between 20th and 26th December, the number of deaths ascribed to influenza recorded in the 57 German towns of over 100,000 inhabitants fell from 535 to 512 and the general death rate per 1,000 inhabitants from 15.1 to 14.2.

Toward the end of December the epidemic invaded the British Isles, where it immediately assumed a more serious aspect. Four million cases appeared in and about London and in the south of England, followed quickly by a rise in the death rate. The general mortality rate between 27th December and 2nd January was 17.0 in the 122 large towns, 18.8 in Greater London, 22.1 in London itself, 22.1 at Bristol and 21.4 at Nottingham. The corresponding rates for the previous week were 10.8, 9.8, 9.0, 12.2 and 14.7, respectively.

It was observed that the majority of deaths occurred in cases of elderly persons. Of the 464 deaths attributed to influenza in London during the three weeks ending 9th January, 46.3 per cent occurred among persons over 65 years of age, and 5.2 per cent among persons of less than 25 years. During the 1933 epidemic 10.6 per cent of the deaths occurred among

persons of less than 25 years; in 1929, 8.8 per cent; in 1927, 10.1 per cent.

The epidemic increased in severity as January advanced, at the same time spreading from the south to the north of England, Scotland and Ireland (thus reversing the direction of the 1932-33 epidemic). During the week ending 9th January, the number of deaths attributed to influenza in the 122 large towns (England and Wales) reached 768 against 325; during the week ending 16th January, this figure rose to 1,100. The following week (ending 23rd January) saw a further increase to 1,137, but at a smaller rate—only 3 per cent. During this fortnight cases had been steadily decreasing in the south, but the epidemic was advancing in northern towns.

The *Weekly Epidemiological Record* reproduces the following report from the British Ministry of Health at the close of January: 'The epidemic continues to decline in the south of the country and is increasing in certain districts in the north. The age distribution of deaths shows a slight decrease in the proportion of deaths at ages over 65, but the proportion of deaths at ages over 65 continues to be more than 45 per cent. The general conclusion to be drawn is that the recrudescence will be less severe in its total effects than that of 1932-33. Some reserve must, however, still be maintained until the position in the north is clear'.

There have been very definite lags between the appearance of the outbreak in the various parts of Europe and even between various cities of the same country. Thus, while the peak mortality occurred in Berlin in the middle of December, it was reached at the end of December only in Königsberg, and in January in Breslau.

The peak of mortality occurred during the last week of December in Copenhagen, and during the first week of January in Amsterdam. In Poland the rates were not affected before the end of December.

No serious outbreak occurred in the Scandinavian and Baltic States, nor in Austria and Hungary. The disease was mild in Spain, France and Switzerland, as well as in Yugoslavia and Roumania.

### LEAGUE OF NATIONS.

#### INFORMATION SECTION.

9th February, 1937.

### THE PRACTITIONER

*The Practitioner* is probably the best-known journal of its kind in the world, and certainly in the English language. It does not publish reports on scientific investigation nor lengthy treatises, but short practical articles by authorities on their own special subjects. Such articles are invaluable to the practitioner in any country and therefore we are always tempted, and quite frequently fall to the temptation, to reproduce these articles almost verbatim in the columns of this journal, naturally with due acknowledgment of their source.

A few pages are devoted to short practical notes, usually on treatment, from other journals, case reports, reviews on recent books, and notes on new preparations.

The format of this journal has always been one of its most attractive features. The paper is stiff but not too heavy, the print is large and easy to read, and the book is of a convenient size to hold. At the beginning of this year the publishers altered the format slightly, making the page a little broader. Artistically they have achieved a great improvement and from a practical point of view there is something to be said for the slightly larger page.

We are glad to see that this change in the outward form of the journal is not accompanied by any other change, such as in the type of article contributed, as no change was necessary. We have now received the first two numbers of this year, and we have no hesitation in recommending wholeheartedly this journal to medical readers in this country.

## Current Topics

### The Tuberculosis Problem among Nurses in a Tuberculosis Sanatorium

By ERNEST S. MARIETTE, M.D., F.A.C.P.

(Abstracted from the *Tubercle*, Vol. XVIII, December 1936, p. 103)

TUBERCULOSIS is an infectious disease that is spread by contact with the patient's sputum rather than by contact with the patient himself and therefore the danger of infection diminishes with the effectiveness of the measures used in the disposal of sputum, etc. Owing to the more rigid observance of the measures of disposal of sputum in a sanatorium, the chances of infection here are less than elsewhere. Nurses when caring for tuberculosis patients for a long time are sure to get the infection. Afterwards they will behave according to: (1) whether they are tuberculin-positive or negative, (2) the length of time of exposure, (3) the connections from which the nurses are drawn, and (4) the nature and condition of the hospital. Only 2 to 10 per cent of those infected with tubercle bacilli fall ill. A tuberculin-positive nurse is less likely to develop serious and fatal tuberculosis as a result of caring for tuberculous patients than the tuberculin-negative nurse, though some believe that primary infection is benign but it makes the individual hypersusceptible to reinfection. According to laboratory experimentation, a mild infection increases the animal's natural resistance to exogenous reinfection when it occurs not sooner than four to six weeks after the first infection, i.e., after allergy has developed. In allergic animals, though the reaction becomes more acute at first after reinfection, it gradually subsides and becomes localized; of course, the smaller the dose of reinfection the better is the chance.

In this investigation all nurses were x-rayed at the beginning of their employment and yearly thereafter but later on they were x-rayed every three months. There were three groups of nurses: (1) supervising nurses, (2) general duty nurses, and (3) student nurses. The results of x-ray examinations of the above three groups of nurses are as follows:—

Group 1. Eighteen (16.5 per cent) had the adult type of tuberculosis at the beginning and another seven (8.3 per cent) subsequently developed the active, adult type of tuberculosis; there were two deaths in this group.

Group 2. Thirty-six (8.9 per cent) had the adult type of tuberculosis at the beginning and another 25 (6.2 per cent) subsequently developed the adult type of tuberculosis. This was considered inactive in eight, or 2 per cent, and active in 17, or 4.2 per cent, of the entire group; there were six deaths in this group.

Group 3. Sixty-eight (6.4 per cent) had the adult type of tuberculosis at the beginning and another 53 (4.9 per cent) subsequently developed the adult type of tuberculosis. This was considered inactive in 27 or 2.5 per cent and active in 26 or 2.4 per cent of the entire group; there were four deaths.

Taking the three as one group 122 or 7.7 per cent had the adult type of tuberculosis at the beginning and another 85 or 5.4 per cent subsequently developed the adult type of tuberculosis which was considered inactive in 35 or 2.3 per cent and active in 50 or 3.1 per cent. There were 12 deaths, five in the initial tuberculosis group and seven in those who developed tuberculosis subsequently. Thus, we see that 3.1 per cent of the nurses developed tuberculosis in the sanatorium. To minimize this the nurses should be

instructed how to protect themselves and the patients should be instructed to be careful about spitting, coughing and sneezing. The nurses should be x-rayed at the beginning and at regular intervals thereafter. Their working hours should be reduced and only tuberculin-positive nurses should be taken in, and if tuberculin-negative nurses are taken in they should be vaccinated with B. C. G.

N. G. M.

### Determination of the Artificial Pneumothorax Containing a Small Quantity of Gas

By E. SCHILL, M.D.

(Abstracted from the *Tubercle*, Vol. XVII, September 1936, p. 549)

To detect the presence of a small quantity of gas in the pleural cavity during the course of collapse therapy x-rays are usually used, but they are not always available, their frequent use is not safe, and, when the pleura is free from any adhesion, they may fail to demonstrate a small quantity of gas. The simple method of percussion over the areas of: (1) the costo-phrenic sinus, (2) the absolute cardiac dullness, and (3) Kronig's area, will help in the matter. Instead of percussing over the Kronig's area Frisch recommends percussion of the apex of the lungs, as given below. Draw a horizontal line between the spinous processes of the first and second dorsal vertebrae and mark on it two points, one on each side, three-finger breadths from the mid-line. Join these two points to a point marking the lowest limit of the scalp in the mid-line. Light percussion on these connecting lines from mid-line outwards enables one to detect a limit of resonance nearer the spine, since the air occupying the cone of the apical pleura is capable of greater expansion. The lower limit of resonance is on the affected side.

In left-sided pneumothorax a diminution of absolute cardiac dullness may be elicited. Gas disappears first from the costo-phrenic sinus, though adhesions of the two layers of pleura make this sign useless, moreover in a bilateral pneumothorax no comparison can be made. The patient lying on his side with the affected side uppermost often helps. Begin percussion a little above the lower limit of resonance and go downwards till dullness is reached, after percussing some time at this point resonance will reappear, go down till again dullness reappears and in this way in a case of pneumothorax you can reach the last rib.

N. G. M.

### A Study of the Pathology of Experimental Pulmonary Tuberculosis in the Rabbit

By E. M. MEDLAR

and

K. T. SASANO

(Abstracted from the *American Review of Tuberculosis*, Vol. XXXIV, October 1936, p. 456)

THE seed, the soil and the lapse of time after the seed and soil are brought together are the three greatest important factors in any infectious disease, whether naturally contracted or experimentally produced. In the study of the problem of human pulmonary tuberculosis all these factors are beyond control, whereas in the field of animal experimentation they can be at least partially regulated. So a thorough understanding of the pathology of pulmonary tuberculosis is not possible from uncontrolled and uncontrollable human material. But if the important pathological processes of pulmonary lesions in man, such as, localization, progression, cavitation, bronchogenic spreads and retrogression, can be duplicated in the experimental

animal then one should be able to understand more clearly its human pathology.

In this article the authors presented the type of lesions obtained in the rabbit which simulate the main pathological features of tuberculous lesions in the human lung. The authors used intravenously in rabbits three strains of tubercle bacilli of three grades of virulence—low, medium and high—the three variants of a single-strain B. C. G. and also investigated the effect of reinfection with bacilli of high virulence in animals vaccinated with both living bacilli of low virulence and killed bacilli of high virulence. The results obtained by them were as follows:—

(a) Bacilli of low virulence—10 to 50 mg.:—very rarely killed the animals; marked pulmonary disease developed; the majority survived for three years. The pathological process in majority resolved within a year and this occurred more rapidly in the anterior and ventral portions of lung than in the posterior and dorsal portions and where the lesions persisted for three years no evidence of cavitation or bronchogenic spreads was found.

(b) Bacilli of high virulence—1 mg.:—death occurred within two months. 0.01 mg.:—death ensued within six months. Lesions progressed evenly in all parts of lung. Suppurating and ulcerating lesions and bronchogenic spreads most common—no gross cavitation.

(c) Bacilli of medium virulence—1 mg.:—animals survived for six months. Lesions—of varying degrees, some with complete resolution in anterior part and gross cavitation in posterior portion. 0.01 mg.:—animals survived for two years. Lesions—complete resolution in anterior portion and gross cavitation and bronchogenic spread in posterior part.

(d) Reinfection in vaccinated animals—extensive pulmonary involvement within two weeks. Some lived for six months with marked resolution of lesions in anterior and ventral lung and gross cavitation with bronchogenic spreads in posterior and dorsal areas.

The difference of the nature of lesions between the anterior and posterior portions of lung led the authors to investigate the possibility of altering the localization of lesions by changing the posture of the animals. They were successful in shifting the main progressive tuberculous process from the caudal to the cephalic portion of the lung parenchyma with the change of posture from normal to upright position for ten hours daily, thus opening up a new avenue of approach toward the explanation of the rationale of apical or sub-apical tuberculosis in man.

From the above findings the authors made these comments that the natural inhalation route of infection is not of prime importance in localizing the progressing cavitating tuberculous lesions as all types of lesions have been obtained by the intravenous inoculation in animals; that the allergic condition of the tissue as a result of primary infection with the subsequent reinfection cannot determine the localization of cavitating tuberculous lesion as similar lesions (the so-called adult human type) have been obtained in animals from first infections with bacilli of every grade of virulence; and that the higher portions of the lung field appear to be less resistant to tuberculous infection than the lower portions as the most progressing cavitating lesions always occurred in these animals in the uppermost part of the lung, whether the animal is in the normal or upright position. The authors concluded that a certain balance between the resistance of the host and the virulence and dosage of parasite must be established either in the first or subsequent infection to obtain localizing cavitating lesions and the so-called adult type of human pulmonary tuberculosis is due in large part to the lodging of the tubercle bacilli in the less resistant upper units of the lung parenchyma.

S. R. G.

## The Intensity of Tuberculin Reaction and Frequency of Demonstrable Tuberculous Lesions

By C. W. WELLS

and

H. H. SMITH

(Abstracted from the *American Review of Tuberculosis*, Vol. XXXIV, September 1936, p. 425)

THE variation in the degree of reaction to the tuberculin test has long been observed. With the advent of intracutaneous tuberculin test, the extraneous factors which are operative with the cutaneous test being largely removed, sufficient interests have been aroused in this varying intensity of the reaction. Investigations have been conducted by various workers to interpret the meaning or importance of this variation in intensity and to correlate it with the degree of infection. The first study of this problem was made by Roemer and Joseph in the guinea-pig, using high dilutions of tuberculin, and they reported a definite correlation between the degree of infection and the intensity of tuberculin test. In recent years investigations were made to associate the more pronounced reactions to intracutaneous tuberculin test with active tuberculosis, on a quantitative basis, and to establish a critical threshold in the dilution of tuberculin which would more or less definitely exclude in the majority of negative reactors the possibility of active tuberculosis.

The present authors conducted a tuberculosis survey in Kingston, Jamaica, from 1931 to 1934 in which 4,906 individuals (a random sample of the population) were tuberculin tested and received chest x-ray examinations. They found that in the 0 to 9 years age group the per cent presenting lesions ranged from 0.5 per cent for negative reactors to 1 mg. to 14.1 per cent in two-, three- and four-plus reactors to 0.01 mg., in the 10 to 14 years age group, no lesion in negative reactors and 14.2 per cent of lesions in the above class of positive reactors and for all ages over 15 years, 5.5 per cent of lesions in negative reactors and 12.1 per cent in the positive reactors.

The average percentages showing lesions are 1.6 in negative reactors to 1 mg., 4.0 in positive reactors to 1 mg., 8.6 in one-plus positive reactors to 0.01 mg., and 12.4 in two-, three- and four-plus positive reactors to 0.01 mg. Thus an increase in the percentage of demonstrable pulmonary lesions, both active and latent, was found by them with an increase in the severity of the tuberculin reaction. The results are shown to be comparable to those of Opie and his associates (1926) for individuals in the school age groups. It was also specially mentioned that a negative reaction does not absolutely exclude active or far advanced tuberculosis as pointed out by Rich and McCordock. Opie and others found 17.3 per cent while the authors found 1.6 per cent of lesions in the group of negative reactors—two of the individuals of this group in the authors' series were suffering from far-advanced active disease.

S. R. G.

## Contact as a Factor in the Transmission of Tuberculosis

By CHARLES SCHUMAN

(Abstracted from the *American Review of Tuberculosis*, Vol. XXXIV, July 1936, p. 85)

In this study an attempt was made to determine the relative importance of different types of exposure in the dissemination of tuberculosis with a view to its control. Three thousand and fifty-seven patients of a tuberculosis clinic, of whom 1,802 were adults and 1,255 children (up to 16 years of age), were the subjects for this survey. According to the history and sputum examination report of the sources of contact the types of exposure were differentiated under five categories: (1) positive sputum, (2) negative sputum, (3) unknown

sputum, (4) deceased cases of tuberculosis, and (5) no known tuberculosis or non-tuberculous cases. The diagnosis of tuberculosis in children contacts was made by history and x-ray. No attempt was made to differentiate between so-called childhood tuberculosis and the adult type. The evidences of tuberculous infection in these children were determined by the intracutaneous Mantoux test, done in the usual manner, with 0.1 mg. OT. The degree of reaction to Mantoux test was also noted from the size of the weal and the swelling of the arm and interpreted as 1+, 2+, 3+ or 4+.

There was a relatively large number (730) of definite cases of tuberculosis among adult contacts as compared to the striking small number (47) in children. Of these 33.5 per cent in the case of adults were in contact with known tuberculosis patients, in contrast with 80.9 per cent in the case of children. According to the author this latter high incidence is apparent as, in the case of a child, the family circle comprises almost the entire extent of his contacts.

The incidence of tuberculous disease in adult contacts according to types of exposure was 23.9 per cent with 'positive sputum', 13.0 per cent with 'negative sputum', 17.3 per cent (which is almost an arithmetical mean between the previous two figures) with 'unknown sputum', 36.7 per cent with 'deceased cases of tuberculosis' and 68.0 per cent with 'non-tuberculous'. In the case of child contacts 7.5 per cent of those exposed to positive sputum, 0.5 per cent of negative sputum group, 4.6 per cent of unknown sputum group, 1.0 per cent of deceased tuberculous group and 5.5 of non-tuberculous group contracted the disease. Regarding Mantoux reactions 65.6 per cent were positive under positive sputum, 27.9 per cent under 'negative sputum', 60.0 per cent under unknown sputum, 70.9 per cent under deceased tuberculosis and 40.2 per cent under 'non-tuberculous group'. Regarding the intensity of reaction the 2+ Mantoux reading was the most common and the 4+ reading the least common in all the groups. The largest number (17) of children exposed to positive sputum developed a 4+ reaction.

Thus children exposed to positive-sputum cases show a high incidence to both tuberculous disease and tuberculous infection. The intensity of the Mantoux reaction depends largely on the time interval between the period of exposure to positive sputum and the date of the test; the more recent the exposure, the greater the reaction to tuberculin.

The author concluded that contact to positive sputum is the greatest single factor in the spread of the disease, that children exposed to positive sputum show an increased degree of sensitivity to tuberculin, that pulmonary tuberculosis is not very common in infant and children, and that the control of positive sputum is the most effective means of limiting the spread of the disease.

S. R. G.

### The Intra-dermal Tuberculin Test in Nurses

By PETER W. EDWARDS, M.B., B.Ch. (Edin.)

(Abstracted from the *Tubercle*, Vol. XVIII, December 1936, p. 101)

THIS study gives a record of a short series of intra-dermal tuberculin test on nurses.

Fifty-four were Mantoux-positive on joining the staff; of these one became tuberculous in six months.

Eleven were Mantoux-negative on joining the staff. Of these two left after the first test; three remained negative: one on third test after four months, one on third test after three months, one on second test after two months and all remained quite fit; six became positive: one on third test after three months, one on second test after eight months, two on second test after ten months (all these four were fit up to the time of report), one in the next month and the remaining one on third test after two months (these last two became tuberculous within two and three months, respectively).

The author also added that out of 43 female domestics so tested, 40 were Mantoux-positive at the beginning and all remained free from tuberculosis. Of the three negatives, one could not be followed up, one remained negative after the third test ten months later and the other was positive on second test a month later and all remained quite fit.

Of the male outdoor staff only six were tuberculin tested. Five were positive at the beginning and the other was negative and remained so on third test after four months. All these appeared fit at the time of report.

N. G. M.

### Results of the Sanocrysin Treatment of Tuberculosis

By F. I. TERRILL

(Abstracted from the *American Review of Tuberculosis*, Vol. XXXIV, July 1936, p. 156)

Forty-one cases, the majority (30) of which were far advanced and the rest moderately advanced, showing no improvement under the usual care, were treated with the soluble gold-sodium-thiosulphate intravenously. The dose was 10 mg. to start with and was gradually increased to 250 mg. which was maintained for from five to eight injections before a rapid increase to 500 mg. was given. The repetition of the last dose depended upon the tolerance of the patient. The injections were given at weekly intervals unless there was some reason for a longer intermission. Weekly urine analyses were made during the course of treatment and for at least six weeks following its conclusion. Only a slight and transient albuminuria occurred in two cases necessitating only an increase in the time-intervals. After 18 months of treatment the results were quite conclusive as to the value of the drug in selected cases. Clinically improved—18, markedly improved—10, not improved—10, and adverse results—3. A gain in weight of over 5 lb. occurred in 16 cases, roentgenogram improvement in 15 cases, a diminished amount of sputum in 19 cases, and the sputum became negative for tubercle bacilli in 10 cases.

Conclusions: intravenous gold is of value in the treatment of tuberculosis and has a definite place in the armament of a phthisiotherapist. It is applicable in selected cases only and should not be substituted for collapse therapy, even for a trial. The early bad results of this treatment following its introduction by Mollgaard in 1928 are thought to be caused by the injection of too large a dose (the customary maximum dose then being 1 gm.).

S. R. G.

### The Use of B. C. G. Vaccine Against Tuberculosis in Children

By C. KERESZTURI

and

W. H. PARK

(Abstracted from the *American Review of Tuberculosis*, Vol. XXXIV, October 1936, p. 437)

THIS study was made under three heads:

(1) Is the B. C. G. vaccine harmless? The vaccine was proved to be harmless by the following observations:

(a) Four hundred to five hundred guinea-pigs, rabbits and monkeys were injected with large quantities of living organisms and only one developed a moderate tuberculosis which might have been due to an accidental laboratory infection.

(b) One hundred and seventy-five young infants were vaccinated with B. C. G. but not exposed to tuberculosis after vaccination. All did as well as the controls with the exception of one case who developed clinical tuberculosis but whose autopsy was refused and hence the diagnosis not settled.

(c) Five hundred and fifteen children were vaccinated with living B. C. G. organisms and exposed to a human tuberculous source. Four of them died of tuberculosis and the rest did well as the controls. From the organs of three out of the four dead cases, the human and not the bovine type of tubercle bacilli was recovered.

(d) In 27 out of 31 instances of cold abscesses occurring at the site of vaccination, B. C. G. bacilli were recovered from the aspirated pus. In none of the instances could the bacilli be shown to have increased in virulence by stay in the human body for periods of one to ten months.

(2) Is the B. C. G. culture effective in the prevention of tuberculosis? To gauge the immunizing effect of the B. C. G. vaccination the tuberculosis death rate among the comparable groups of B. C. G. vaccinated cases and the controls was studied. The children known from birth were vaccinated by mouth with B. C. G. vaccine within the first ten days of life and those that were not known from birth, had no evidence of tuberculosis and had negative initial Mantoux test, were parenterally vaccinated with B. C. G. vaccine (intracutaneously or subcutaneously). Both these groups were studied with their corresponding control groups for periods up to eight years. There were 300 to 400 cases in each group. The total number studied was 1,445. It was also noted whether these children were exposed to a case of tuberculosis with positive sputum or to one with negative sputum or not exposed at all to tuberculosis. Among the control children, known from birth, the tuberculosis death rate was found to be more than twice as high as among the orally-vaccinated ones, while among those not known from birth it was about four times as high as among the parenterally vaccinated babies. Regarding non-tuberculous mortality which was 5.2 per cent in the total group, it was lowest in the parenterally vaccinated children (2.8 per cent). In all the groups compared, the exposure to tuberculosis was remarkably similar, only one-third to half of all cases in each group were exposed to open tuberculosis; about one-third to closed tuberculosis, and less than one-third not exposed at all to tuberculosis. Therefore the tuberculosis death rate difference was not the result of unequal exposure, but a reliable one and, after statistical analysis, was shown to be of probable statistical significance. As the tuberculosis death rate rises in both sexes with age, this B. C. G. study should be continued until the child reaches maturity and the authors selected a portion of these children for follow-up.

(3) Should the B. C. G. vaccination be used as a health measure? The tuberculosis death rate among the authors' control cases, i.e., B. C. G. unvaccinated cases, was 2.7 per cent which was 45 times greater than the corresponding figure among children of the general population and the death rate of children of open tuberculous families (7.2 per cent) was 120 times more than the corresponding number of the general population. These differences are so enormous that, in the authors' opinion, it is worth while to use the B. C. G. vaccine to diminish the risk of death due to tuberculosis among children of tuberculous families. As the contrast between the death rates of the groups compared becomes smaller with the increase in age of the children, the B. C. G. vaccine should be given as early as possible. The authors also think that, if all children of tuberculous families could be found at birth and separated from tuberculous contact three months before and after vaccination until allergy to tuberculin appears, the B. C. G. could be made much more effective. Thus the authors concluded that the B. C. G. vaccine is harmless to animals and to human beings, the parenteral method of vaccination is more effective than the oral, and the use of the B. C. G. vaccine, being harmless and helpful in increasing the resistance to tuberculosis, should be urged as a public health measure for the prevention of tuberculosis in those not yet infected but who may be exposed to tuberculosis in their own families.

S. R. G.

## Tuberculosis in Hospital Nurses

By J. HEIMBECK, M.D.

(Abstracted from the *Tubercle*, Vol. XVIII,

December 1936, p. 97)

THE following are the results of the investigations on the Ulleval nurses and on tuberculous diseases among them. The author employed the von Pirquet's test in the investigation. The working theory of the author was that tuberculous diseases in general manifest themselves at the time of primary infection, or immediately after it, i.e., whilst they are becoming allergic. At the beginning of the investigation there were some nurses who were von Pirquet-positive and who passed their primary infection without any disease, and others were negative to the von Pirquet's test. He found that after three years' service in the hospital all von Pirquet-negative nurses became von Pirquet-positive and some of whom passed their primary infection without any disease. He vaccinated some of the von Pirquet-negative group with B. C. G. vaccine and of this group, some were rendered von Pirquet-positive by vaccination and some remained negative after the vaccination. Afterwards some of the above negatives in connection with the vaccination passed their primary infection without any disease. The results were as follows:

(i) Morbidity among the nurses who passed the primary infection without any disease: 800 persons with 3,502 observation years 30 ill, i.e., morbidity of 8.5 per 1,000 observation years.

(ii) Morbidity among those who were primarily infected: 387 persons with 765 observation years and 118 ill, i.e., morbidity of 152.9 per 1,000 observation years.

(iii) Total morbidity among the B. C. G. vaccinated: 439 persons with 1,260 observation years and 33 ill, i.e., morbidity of 26.1 per 1,000 observation years.

(iv) Morbidity among those who became von Pirquet-positive in connection with B. C. G. vaccination: 287 persons with 910 observation years and eight ill, i.e., morbidity of 8.3 per 1,000 observation years.

N. G. M.

## Bilateral Pneumothorax and Pregnancy

By E. SCHILL, M.D.

(Abstracted from the *Tubercle*, Vol. XVII,

September 1936, p. 551)

THE majority of people believe that pregnancy in tuberculous patients is harmful because extension of the disease is possible during pregnancy and because such extension occurs in childbed and afterwards. Pneumothorax offers possibilities of improvement of tuberculosis during the development of pregnancy. Case reports show that some even with extensive bilateral disease when treated with collapse therapy improve and bear well the efforts of labour, while others go down hill. So it is better to treat a patient with collapse therapy and watch her during the first three months of pregnancy. If, in spite of the treatment, the condition of the patient becomes worse the pregnancy should be terminated as interruption of pregnancy is possible any time within the first three months, though earlier the better, whereas interruption after three months has the same risk as in full-time birth. On the other hand, if the patient improves with the treatment of collapse therapy or if she presents herself after the third month, the pregnancy should be continued.

In pregnancy, with the increase of the uterus, the diaphragm is pushed up as in phrenicotomy, thereby diminishing the volume of the chest cavity. For this reason the disease generally improves during the second half of pregnancy and the same amount of collapse is obtained with smaller quantity of gas given at greater intervals. But after delivery the diaphragm suddenly descends as the uterus diminishes in size and a quiescent process flares up and smaller quantity of gas at greater



intervals becomes insufficient. So immediately after child birth refills should be commenced.

In unilateral treatment, during refills such quantity of gas should be given as will produce the maximum collapse. Gas given beyond this point will increase the pressure and not the collapse owing to the weakness of the mediastinum. In bilateral treatment each side is filled separately and there is no chance of pushing over the mediastinum or torsion of the great vessels. It is better to begin first on the side which shows more resorption. Owing to the greater strain on the heart digitalis is recommended if the pulse and respiration rates increase.

N. G. M.

## Observations on the Red-cell Sedimentation Test in Pulmonary Tuberculosis

By H. A. PATTERSON

(Abstracted from the *American Review of Tuberculosis*, Vol. XXXIV, July 1936, p. 164)

THE sedimentation reaction is a non-specific reaction of citrated blood and is generally regarded as a measure of pathological activity. The test cannot be used in diagnosis. To determine its relative value a study was made on 312 pulmonary tuberculosis cases. A total of 1,698 sedimentation tests was done. In performing the tests the 1 c.cm. technique as described by Cutler was employed. The sedimentation index and the sedimentation time were recorded and the results were graphically expressed to obtain sedimentation curves, generally divided into four groups: (a) horizontal line (normal), (b) diagonal line (mild activity), (c) diagonal curve (moderate activity), and (d) vertical curve (severe activity). The 312 cases reported consisted of 180 patients under treatment in hospital, 110 discharged cases, and 22 fatal cases. The cases were classified according to the National Association classification into three groups—incipient, moderately advanced and far advanced, and each of these into active, quiescent, apparently arrested and arrested according to pathological and clinical pictures.

The normal index, based on a study of 20 adult males, was 3.5 mm. The incipient cases gave an index of 3.9 mm.; the moderately-advanced cases 7.0 mm. and the far-advanced cases 14.1 mm. The active cases (795 tests) gave an index of 12.9 mm.; the quiescent cases (294 tests) 6.0 mm.; the apparently arrested cases (193 tests) 4.9 mm. and the arrested cases (316 tests) 3.2 mm.

The artificial pneumothorax cases in this series showed an improvement in the index in proportion to the degree of collapse obtained. The clinical improvement following pneumolysis operations (in seven instances) was also shown by the index. With a few exceptions the index coincided with the pathological involvement in most of the 312 cases. The test was found to be helpful in eliciting changes in some cases earlier than would be shown by temperature, pulse or respiration. Because of the value and simplicity of the test the patients should be advised to have frequent sedimentation tests done after leaving the hospital.

S. R. G.

## The Diagnosis of Cavities in Pulmonary Tuberculosis by Means of the Tomograph

By J. B. McDOUGALL, M.D.

(Abstracted from the *Tubercle*, Vol. XVII, July 1936, p. 452)

FORMERLY, when most of the sanatoria and the dispensaries were not equipped with x-ray apparatus, it was very difficult for a medical officer to arrive at a

definite diagnosis of tuberculosis, and he had to depend mainly on physical signs. But, after the war, with the introduction of collapse therapy and the proper and accurate diagnosis the demand for the x-ray has increased, and now every properly-equipped unit must have x-ray facilities available. With the increase of x-ray plants and with the development of thoracic surgery, the standard of x-ray pictures has greatly improved. But the new method of tomography is a further advance on all previous x-ray techniques, specially in the diagnosis of cavities which may be obscured from direct vision in the usual antero-posterior x-ray pictures. In x-ray pictures we not only see the shadow of the lung tissue but that of ribs also which may obscure a lung lesion or may lead to distortion of the lesion. X-rays may fail to detect small cavities, especially when they are situated in the posterior aspect of the lungs, but the tomograph will help us to detect such cavities. The tomograph can take actual sections of the chest at any level but for ordinary purposes three sections are taken: (1) Ventral—about 7 cm. from the anterior chest wall, (2) medial—at the level of the hilum, and (3) dorsal—about 7 cm. from the posterior chest wall. In the tomograph the shadows of the ribs are almost eliminated, the sternum and the vertebral column are not shown as bony structures, though in the dorsal section the outer ends of the ribs and the outline of the vertebral column may appear. Such results are obtained only because the tube and the film holder move in a contrary direction during the time of exposure which is normally of one second. With this instrument we can reproduce only a plane of the chest at any level when the tube and the film describe an arc of about 45° during the exposure, but when the arc becomes less and less, for which the apparatus has additional adjustments, the sections reproduced become thicker and thicker, and, when the tube and the film are kept stationary, the entire thickness of the chest is reproduced. Lateral views are difficult to read with a tomograph for the appearances of a certain number of unknown shadows.

N. G. M.

## Tuberculin P. P. D. in the Treatment of Tuberculosis

By B. C. THOMPSON, M.A., M.D. (Camb.)

(Abstracted from the *Tubercle*, Vol. XVIII, October 1936, p. 27)

P. P. D. in tablet form containing 0.05 mg. of active substance was used. It was dissolved in 1 c.c. of diluting solution supplied by the manufacturers (Messrs. Parke, Davis and Co.) and then made up to 10 c.cm. by sterile water in a sterile rubber-capped bottle. When needed the required amount could then be withdrawn from this bottle by a needle and syringe.

Injections were given subcutaneously every week into alternate arms. If the reaction from the previous injection persisted, the interval was prolonged. In non-pulmonary cases the initial dose was 0.02 c.cm. (0.0001 mg. P. P. D.). The second dose was 0.05 c.cm. and thereafter the dose was doubled weekly until a local reaction was produced. After this the dose was increased by one-quarter to the limit of tolerance. In this series the treatment was successfully completed in periods varying from two to twenty-six weeks.

This treatment was given to 59 patients. This included the following:—cervical gland tuberculosis—54; pulmonary tuberculosis—2; tuberculosis of the hip—1; renal tuberculosis—1; phlyctenular keratoconjunctivitis—5 (four of them had cervical gland tuberculosis).

There was improvement in 32 amongst the group of 54 cervical gland tuberculosis. Considerable reduction in the size of the glands occurred in 13, great reduction in ten and in nine glands are almost impalpable. It

was found that when palpable fluctuation was obtained in the glands, surgical treatment was required in addition to medical treatment.

This method of treatment was not successful in other types of the disease included in this series.

The results obtained by P. P. D. treatment in this series were found to be inferior to the results obtained by the same author by Beranek's tuberculin treatment in a series of 42 cases of cervical gland tuberculosis.

It was suggested that P. P. D. is relatively deficient in that tuberculin principle which produces focal reaction and the beneficial results obtained are due mainly to the increase of general immunity level. The author therefore suggested that P. P. D. used for intradermal test would be safer than old tuberculin because there would be less possibility of lighting up latent tuberculous foci.

P. K. S.

## Reviews

**ARTIFICIAL PNEUMOTHORAX: EXPERIENCE OF THE LONDON COUNTY COUNCIL.**—By F. J. Bentley. Medical Research Council, Special Report Series No. 215, 1936. Published by His Majesty's Stationery Office, London. Pp. 94. Illustrated. Price, 1s. 6d.

In part I of the book the author gives an extensive digest of literature on artificial pneumothorax of almost all the countries, and pointed out the shortcomings in these articles which were unfortunately too frequent. He concluded that 'seven deadly sins which all investigators in this field must avoid are as follows:—

1. *Paucity*.—To draw conclusions from too small a number of cases.

2. *Selection*.—To write up only certain of one's cases.

3. *Precipitancy*.—To report on cases before a sufficient period has elapsed.

4. *False control*.—To evaluate results by comparison with the fate of patients having extensive pleural adhesions.

5. *Equivocation*.—To employ equivocal definitions as to degree of collapse.

6. *Failure to trace*.—To lose sight of a high proportion of patients.

7. *Lack of detail*.—To fail adequately to describe the extent of disease.

Amongst these sins he specially stressed the importance of taking those cases where pneumothorax was not possible, due to adhesions, as the control group. Cases with pleural adhesions fare worse than those with free pleural space even when there is no question of pneumothorax therapy. He, therefore, emphatically says that such controls would not be accepted in assessing the result of pneumothorax therapy.

He attempted to clarify the position of pneumothorax therapy by a study of the London experience. In about 10 per cent of all cases of pulmonary tuberculosis pneumothorax was done of which less than one-quarter consisted of strictly unilateral and complete collapse cases. Six hundred and seventy-seven new cases of pneumothorax were followed up over a period of three to thirteen years. Five hundred and eleven of these were investigated in considerable detail. His control group consisted of 3,329 cases. These were treated by the conservative method only and were drawn from identical sociological and environmental sections of the population. He did not claim this group to be a perfect statistical control, the attainment of which, he considers, is not possible, but this provides a useful base line from which to evaluate, in broad outline, the results of pneumothorax treatment.

The pneumothorax group consisted of—

(A) Cases in which tubercle bacilli have never been demonstrated in the sputum, pleural fluid, faeces, etc.—7.2 per cent.

(B) Sputum positive in tubercle bacilli.

(B1) Cases with slight constitutional disturbance if any, and slight extension—3 per cent.

(B3) Cases with profound constitutional disturbance—14.5 per cent.

(B2) Intermediate group between (B1) and (B3)—75.3 per cent.

The average period of the duration of pneumothorax treatment in all cases was 18.8 months and in the complete cases the average period was nearly three years.

Of these 677 cases, 411 were observed over a minimum period of five years and the rest over a minimum period of three years. The control group of 3,329 were followed up for five years.

### RESULT OF TREATMENT ACCORDING TO SEX AND AGE

#### Three-year survivals—677 cases

Males—Results of treatment seem good, i.e., statistically significant at ages 15 to 34, 40 to 44 and all ages.

Females—Results significant at ages 15 to 19, 25 to 39 and all ages.

#### Three-year survivals—411 cases

Males—Results significant at ages 15 to 24 and all ages.

Females—Results significant at ages 15 to 19, 25 to 34 and all ages.

#### Five-year survival—411 cases

Males—Results significant at ages 20 to 27, 40 to 44 and all ages.

Females—Results significant at ages 15 to 34 and all ages.

A striking fact evolved was that the age group of 20 to 25 yielded good results in males and poorest results in females. In both sexes the age group of 25 to 30 produced favourable results.

Result of the treatment in the 677 new cases showed that at the end of three years there was 19.1 per cent gain in lives as compared to the conservative group. In the smaller group of 411 cases—the gain in lives after three years was 18 per cent and at the end of five years 19.8 per cent.

The difference of result between complete collapse and incomplete collapse cases was very striking. In the whole series 60 per cent belong to the incomplete collapse group and 40 per cent to the complete collapse group. In this incomplete collapse group only 50 per cent survived a period of three years while in the complete collapse group 65.9 per cent were alive after three years and when the disease was strictly unilateral the percentage of survivals rose to 77.4.

The author lays special stress on the result in 'complete' unilateral cases. Even with complete collapse the presence of only slight contralateral disease materially reduces the chance of survival. Strictly unilateral cases even with incomplete collapse fared better than complete collapse cases with but 'slight' contralateral involvement.

He stresses the point that we should concentrate on collapse and not on pneumothorax therapy only; and no effort must be spared to obtain optimum collapse. Complete collapse more often renders the sputum negative than incomplete collapse. In complete collapse group 65 per cent were sputum negative and in the incomplete group it was less than 50 per cent. In the sputum-negative group 90 per cent of the subjects were alive after three years whereas in the sputum-positive group it was approximately 75 per cent.

Pneumothorax in suitable cases also made the lesions quiescent quicker. In this group the disease became quiescent at the end of three years in 65 per cent of cases, whereas in the conservative group it was 38 per cent. Working capacity was also increased in the pneumothorax group.

The author stresses the importance of after-care and states that it should be strictly followed both in pneumothorax cases and also those cases who quiesce without pneumothorax.

In conclusion, he states that in these 10 per cent of all cases the improvement was 20 per cent, so the improvement by this method of treatment in all cases would be about 4 per cent which will not materially alter the gross statistical results of all cases of tuberculosis. But this therapy will continue to be of vital importance to selected individual sufferers.

P. K. S.

**TRACHOMA.**—By A. F. MacCallan, C.B.E., M.D., F.R.C.S. 1936. Butterworth and Company (Publishers), Limited, London. Pp. xvii plus 225. Illustrated. Obtainable from Messrs. Butterworth and Company (India), Limited, Calcutta. Price, Rs. 14

THIS monograph has been written to take the place of the author's former *Trachoma and its Complications in Egypt* (Cambridge University Press, 1913), and embodies the Hunterian Lecture at the Royal College of Surgeons of England 1936 on the surgery and pathology of trachomatous conjunctivitis.

So much work has been done on trachoma during the last ten years that an up-to-date book on the subject was badly needed and surely no one was more worthy to undertake this task than Mr. MacCallan with his vast experience of this widespread disease. The author has discussed his subject in great detail in nine chapters. These consist of an introduction to the study of trachoma, the clinical manifestations, the sequelæ, the complications, the differential diagnosis, the treatment, the pathological anatomy, the epidemiology and, finally, the history. There are also two indices—the author and the subject.

In a country like India where trachoma is so prevalent, the chapter on treatment will be of special interest as many of the sequelæ one sees are due to incorrect medical treatment and mutilating operations. How often does one come across cases of trichiasis and entropion treated by the removal of a piece of skin from the lid which should never be done. One must question the accuracy of the figures in the incidence of trachoma in India although they are taken from the Annual Report of the Public Health Commissioner with the Government of India 1931 and the War Office Report 1931. It would be of interest to know who was responsible for the investigations. In Bengal where there is a population of 50 millions trachoma is uncommon, except in those who have recently migrated from northern or central India.

It is also interesting to know that the ætiology of trachoma is still incomplete, as the *Bacterium granulosis* of Noguchi has not been proved to be the causative organism. The clinical diagnosis in the absence of elaborate apparatus may be impossible and no aids are to be obtained by microscopical or chemical tests.

The book is a most excellent one and can be regarded as a classic. It is written in a clear, simple manner and the illustrations and reproductions of paintings are numerous and most excellent.

India in general must owe a great debt of gratitude to the author for reproducing an up-to-date book on this important disease which is responsible for so much suffering and blindness. We strongly recommend it to all ophthalmic surgeons in India and to medical officers who are interested in the subject of trachoma.

E. O'G. K.

**FAVOURITE PRESCRIPTIONS.**—Edited by Sir H. Rolleston, Bt., G.C.V.O., K.C.B., M.D., F.R.C.P., and A. A. Moncrieff, M.D., F.R.C.P. 1936. Published on behalf of the 'Practitioner' by Eyre and Spottiswoode (Publishers), Limited, London. Pp. 227. Price, 10s. 6d.

We have referred elsewhere in this number to that excellent journal, *The Practitioner*.

A very useful series of articles that they published during the last year or so was entitled *Favourite Prescriptions*; these have now been issued in book form. Each contribution was a short discussion on the pharmacopœia of one of the leading London hospitals, either general or special.

The first chapter is rightly devoted to the pharmacopœia of St. Bartholomew's Hospital, London's old hospital, founded in the year 1133. Its first pharmacopœia was however not published until more than 600 years later, 1743. No prescriptions appear to have survived the two hundred years since this date, but many prescriptions have undergone few or unimportant changes during the last fifty years.

We claim to be followers of a progressive science but it may be said to our credit that when we see that a thing is good we are very ready to leave well alone.

An interesting contrast is the chapter on the favourite prescriptions of the Tropical Diseases Hospital. There quinine is almost the only drug that is not a parvenu. It must shake its family pride to have to associate with such upstarts as atabrin, neostibosan, carbon tetrachloride, yatren and tryparsamide.

This is a book which should prove to be a 'best seller' as it will appeal to many of us on account of the memories it revives, very much to our advantage if we have strayed away from the habit of writing simple and cheap prescriptions, and to others who were—in our opinion—less fortunate and received their medical training elsewhere by placing at their disposal time-honoured and cheap prescriptions suitable for almost any occasion that may arise in their daily practice.

L. E. N.

**EXOPHTHALMIC GOITER AND ITS MEDICAL TREATMENT.**—By I. Bram, M.D. Second Edition. 1936. The C. V. Mosby Company, St. Louis. Pp. 456, with 79 illustrations. Price, \$6.00.

THIS monograph on the subject of Grave's disease is based on the experiences of the author who has been treating this malady by medical means for over two decades and on his studies on this subject. The author has discussed the various theories as to the causation of the disease and has adopted the hypothesis that the disease is a 'generalized dysfunction of the vegetative nervous system and the entire chain of endocrine organs—a neuro-endocrine dysfunction'. The patient is believed to have an inherited or rarely an acquired neuro-endocrinopathy, serving as the predisposing factor, and it requires but the torch of an exciting cause, usually an emotional strain, a psychic trauma or, rarely, an intoxicant, to light up the symptoms. To support his theory as to the value of the exciting causes, he has cited a large number of case histories.

To the protean symptomatology of the disease no less than six chapters have been devoted and a fairly exhaustive account of the symptoms and complications has been given. A full description of the various eye signs associated with exophthalmos has been given. It is time that those signs that 'do not add materially to the ease and certainty of diagnosis' and that have become a tradition in medicine, should receive less important attention. Description and enumeration under symptomatology of all sorts of symptoms, viz. neuritis, tetany, scurvy, osteoporosis, etc., observed occasionally in Grave's disease appear to be of doubtful value.

Diagnosis and differential diagnosis have been dealt with thoroughly. The author has tried to differentiate between thyrotoxicosis and Grave's disease by considering no less than twenty points of difference. The entity

of most of the differentiating points is, to say the least, doubtful and the difference between the symptoms of thyrotoxicosis and Græve's disease is really very little.

The author has discussed a large number of tests and has found the estimation of basal metabolic rate and the quinine test to be useful. No mention is made of the methods of estimation of the basal metabolic rate or of the simple formulae, e.g., Reid's, employed for the purpose.

The author believes the treatment to be entirely non-surgical by adoption of hygienic, psychotherapeutic and medicinal measures. He regards surgery and destructive radiation as palliative measures only. To support his views he has brought forward the successful results of a large number of cases treated medically.

If his methods are followed with similar success in other parts of the world by other authorities on the subject, the standard textbook teaching that medical treatment is but palliative and that curative treatment is either by surgery or destructive radiation of the thyroid, and the dictum that the 'indication for operation is the diagnosis of hyperthyroidism' will have to be revised.

R. C.

**THE OPERATIONS OF SURGERY.**—By R. P. Rowlands, M.S. (Lond.), F.R.C.S. (Eng.), and P. Turner, B.Sc., M.S. (Lond.), F.R.C.S. (Eng.). Eighth Edition. 1936. Volume I. (The Upper Extremity—The Head and Neck, The Thorax, The Lower Extremity, The Vertebral Column.) J. and A. Churchill, Limited, London. Pp. x plus 1045, with 435 illustrations (38 in colour). Price, 36s.

For nearly half a century Jacobson's 'Operations of Surgery' has been in the library of almost every practising surgeon. This first volume of the eighth edition has fully maintained the high standard of its predecessors, but one cannot help regretting that though the general arrangement and much of the text remain as written by the late Mr. W. H. A. Jacobson, his name has now disappeared from the title and has been given but brief reference in the preface.

The present editors have had the assistance of several distinguished members of the staff of Guy's Hospital in rewriting specialized sections of this edition. To one familiar with previous editions, the new sections are readily picked out. Without exception they are excellent; one would be surprised to find otherwise in this work. They are also well balanced in length and manner of presentation, features usually lacking in works of multiple authorship. Continuity of style is fair, but in this respect perfection is impossible under the circumstances.

Textbooks on operative surgery are usually encumbered by the description of a number of operations which are often set as tests of surgical anatomy at operative surgery examinations, though seldom performed on the living subject. The post-graduate finds these operations fully described for his benefit in several books on surgical anatomy. They should have no place in a work of an essentially practical nature. In this volume several of these have been omitted. There is, for example, no mention of the Chopart and Lisfranc amputations. The editors are to be congratulated on having the courage to leave them out, and it is to be hoped they will carry the principle further in future editions.

J. C. D.

**SYNOPSIS OF ANO-RECTAL DISEASES.**—By L. J. Hirschman, M.D., F.A.C.S. 1937. The C. V. Mosby Company, St. Louis. Pp. 288, with 174 text illustrations and 6 coloured plates. Price, \$3.50.

We have nothing but praise for Dr. Louis J. Hirschman's little book, *Synopsis of Ano-Rectal Diseases*, for it clearly describes the outlines of diagnosis and treatment of all the common affections of

the anus and rectum in a manner which will be of great assistance to the general practitioner.

The first third of the volume is entirely devoted to methods of examination, enumeration of equipment, etc., and, though this may seem to be excessive in a work of this size, the description is so excellent and so full of sound common sense that the amount of space taken up could not be lessened without detracting from the usefulness of the book.

In the section on hæmorrhoids the author, like that great English proctologist, Ernest Miles, exhorts the general practitioner to take a greater interest in this disease, and never to treat a case of rectal bleeding as merely one of piles, without a very full examination of the anus and rectum. Plate I which illustrates a carcinoma of the rectum complicating prolapsing hæmorrhoids is an example of the great importance of examining all cases of piles in the fullest manner.

Anal papillitis, rectal prolapse, and the removal of foreign bodies from the anal canal and rectum are fully dealt with. The book is well printed and the illustrations are good.

H. E. M.

**WEIGHT REDUCTION DIET AND DISHES.**—By E. E. Claxton, M.B., B.S. (Lond.), D.T.M. & H. With Recipes by Lucy Burdekin. 1937. William Heinemann (Medical Books) Limited, London. Pp. x plus 199. Price, 8s. 6d.

A STUDY of the history of man has shown him at all times concerned with his self-preservation and protection in a world which was full of unforeseen and often unpleasant contingencies. Abstention from food or drink in the interests of a propitiating diety and later on asceticism in the hope of salvation in the next world were often the motives. The present century has however seen a waning absorption in the future and a greater attention of man on himself, his fellows and the present.

The cult of weight reduction by diet and exercise is probably designed to attain better health, retain youth, and the approval of others, in which notably the desire for sex appeal plays a large part. The methods employed, namely diet and exercise, are probably the modern form of the abstention practised by primitive man along with the more positive athleticism of the Greeks. Whatever Freud may say about the real nature of inhibition taboo, who can deny that the present cult is more or less rational in its object and in its methods?

The author has written quite a sensible book on weight reduction, not quite but almost, without tears. The main principle simply is that the calorie intake should be suitably adjusted so as to be slightly below the requirements but not such as to cause a great loss of protein or an acidosis. No drugs are recommended, attention to exercise and food are the bulwarks of the scheme. A number of useful recipes is given—a biscuit sweetened with saccharine and containing bran, gum and mineral oil as a dough mixture is the most formidable. The scheme is graduated and success depends largely on self-discipline while carrying it out.

H. E. C. W.

**A TEXTBOOK OF SURGERY.**—By American Authors. Edited by F. Christopher, B.S., M.D., F.A.C.S. 1936. W. B. Saunders Company, Limited, Philadelphia and London. Pp. xix plus 1608, with 729 illustrations. Price, 42s.

A WELL-BOUND, well-printed and well-illustrated book following the classical arrangement of the English surgical textbooks. Indeed, the similarity of the arrangement to those of Rose and Carless is rather striking.

The subject has been divided into many small sections, each signed by its author. One hundred and eighty-nine authors have taken part in the compilation, the list of them occupying ten pages. Many names of international repute occur in this list and no pains have been spared to make the contributions as complete as was consistent with space available.

This method of compilation has resulted in an authoritative work of reference in a reasonable compass. To the practitioner it can be recommended for this purpose. The student will also find it useful for reference, but for systematic study will probably prefer a broth prepared by fewer cooks.

J. C. D.

**CYSTOSCOPY AND UROGRAPHY.**—By J. B. Macalpine, F.R.C.S. (Eng.). Second Edition. Revised and Enlarged. 1936. John Wright and Sons, Limited, Bristol. Pp. xv plus 478, with 297 illustrations in the text and 14 coloured plates. Price, 30s.

It is some ten years since the first edition of this book appeared, prior to which the surgeon desiring a volume dealing solely with cystoscopy had been forced to resort to foreign publications. It filled a need at the time, and it can be safely predicted that this up-to-date second edition will be equally popular.

The text of the present edition has been almost completely rewritten and is nearly half as large again as the original. This is partly due to the addition of urography to its scope—with consequent addition to the title—but is also due to fuller text and greater number of illustrations, the latter being practically double the number in the first edition.

The practical use of the instrument is described fully but not tediously. The pathology is well illustrated, the coloured plates being particularly true to life. The controversial subject of endoscopic prostatic resection is discussed in a fair and interesting manner. Sections dealing with renal function tests, pelvic resorption and congenital anomalies have been included.

Though all who use the cystoscope can profit from this book, it will be of particular value to those whose opportunities for genito-urinary work do not occur with sufficient frequency to keep them skilled in the use of endoscopic instruments. The trifling mistakes which so frequently shipwreck the efforts of the occasional operator may be avoided by a study of the explicit practical data given.

J. C. D.

**SICK CHILDREN: DIAGNOSIS AND TREATMENT.**—By Donald Paterson, B.A. (Manitoba), M.D. (Edin.), F.R.C.P. (Lond.). Second Edition. 1937. Cassell and Company, Limited, London. Pp. 600, with 15 half-tone plates and 76 figures in the text. Price, 12s. 6d.

THIS is a practical handbook of children's diseases designed for the student and the practitioner. Stress is laid on symptoms, diagnosis and treatment, but aetiology and pathology are by no means neglected. There are numerous illustrations. The style is particularly concise and clear and a large amount of information is given in a very compact volume. Descriptions of less common conditions are printed in smaller type and references to other works are numerous and are printed as footnotes instead of at the end of chapters. These points will commend the book to students working for examinations. A table of normal data relating to children is printed on the inside of the cover. There are two appendices, one giving quantities of drugs for children at different ages, and the other giving copies of recent examination papers in pediatrics and nursing of sick children.

The methods of feeding the healthy and sick infant are described in detail and disorders of nutrition are treated more fully than other diseases of children. The clear directions regarding diet in treatment are perhaps the most valuable feature of the book. This edition includes a description of the later work on the nutritional anæmias of infancy.

The book deals with facts rather than theories and provides an excellent introduction to the study and practice of pediatrics.

M. N.

**SAFE CHILDBIRTH—THE THREE ESSENTIALS—**  
1. ROUND BRIM. 2. FLEXIBLE JOINTS.  
3. NATURAL POSTURE.—By K. O. Vaughan, M.B. (London). 1937. Baillière, Tindall and Cox, London. Pp. ix plus 154, with 49 illustrations. Price, 7s. 6d.

THIS stimulating and original book dealing with the problem of childbirth is written by one with a long experience of midwifery in India. Her investigations followed her personal observation of the contrast afforded by the easy and safe labours of women living under natural and healthy conditions and the prolonged and often dangerous labours of *purdah* women. The book will therefore be of a particular interest to men and women practising in this country.

The object of the book is, the author says, a practical one, namely, 'to simplify our attendance on childbirth while making it a safer and easier process for both mother and child'. Dr. Vaughan has made a survey of customs during childbirth and the ways of delivery as practised in many parts of the world and at different periods of history. Her conclusions are important to a generation faced in the West with a more or less stationary maternal mortality and in the East with rapidly-spreading artificial conditions of living.

The author is convinced that the three essentials for easy and safe delivery are the round pelvic brim, flexible pelvic joints and the natural posture during childbirth. She presents very strong arguments in support of this theory and makes recommendations, some of which she has had the opportunity of testing, as to how they may be achieved. All who practise midwifery in this country will find much in their own experience to support what she says and the book will doubtless provoke considerable discussion and thought.

At a time when the process of labour is tending to become more artificial this book comes as a timely warning, and it may quite possibly result in a de-civilizing movement, regarding the preparation for and conduct of childbirth, which will greatly benefit the race.

M. N.

**DENTAL SURGERY FOR MEDICAL PRACTITIONERS.**—By B. A. Kopkin, L.D.S. (R.C.S.), Eng., with a foreword by Sir Norman G. Bennett, M.A., M.B., B.Ch. (Camp.), L.D.S. (Eng.). Henry Kimpton, London. Pp. x plus 109. Illustrated. Price, 5s.

THIS small book aims at establishing a liaison between the medical and dental professions in regard to cases which are referable to both the medical man and the dentist.

The title is slightly misleading as the book does not deal with the dental work which might fall within the scope of the general practitioner, but is more a warning to the doctor to avoid pitfalls in dealing with purely dental matters.

The book opens by postulating that mistaken diagnosis by the doctor may lead to recrimination after a visit to the dentist who has to revise the original diagnosis. Reading the book dispassionately, the doctor seems to occupy one of the Biblical pens, whether amongst the sheep or the goats is not too clear.

Most of the book is scrappy and contains little of abiding interest to the medical man.

Chapter II deals with the administration of nitrous oxide, and the anaesthetist is delegated to perform other duties than those purely concerned with anaesthesia. This is surely not quite the usual routine in operative procedure.

Chapter III is devoted to dental caries in which the doctor is advised to refer the patient to the dentist *before the tooth pains*. It is scarcely to be expected that the patient will consult a doctor before he finds something to complain about.

Chapter IV deals with pulpitis and periodontitis and the differentiation of gingivitis and pyorrhœa alveolaris is not very clear.

Chapter VI is two pages long and is devoted to toothache.



Chapter VII is probably the best in the book and deals with local anaesthesia, the illustrations being clear. The only anaesthetics mentioned are novocaine and cocaine.

Emergency treatment is discussed in chapter VIII and contains relevant matter relating to the extraction of teeth.

In chapter IX, dental treatment during pregnancy is touched on, and a diet full of calcium salts and vitamins is recommended. This part might have been extended and more subject matter included in relation to both calcium and the vitamins.

Chapter XIII deals with oral sepsis and general diseases. Here, in relation to general diseases, mention might have been made of diabetes mellitus, in which it is a common occurrence to find marked reduction of blood sugar following removal of a septic focus in the mouth.

This first chapter on 'some dental operations' will not tempt the medical man to venture into the realms of dentistry.

Although this little book is rather serappy and incomplete, it might interest the busy practitioner, as the whole book can be read in a couple of hours.

This attempt to co-opt the two professions is laudable and the book might be of use to the newly-fledged medico, whose dental training is usually chimerical.

The skeletal framework of the book is complete, but a little flesh on the dry bones would lead to better action.

D. M.

**RASA-JALA-NIDHI OR OCEAN OF INDIAN CHEMISTRY AND ALCHEMY.**—By Kavraj Bhudeh Mookerjee, M.A., Rasacharya. Published by the author from 20, Grey Street, Calcutta. Volume I, 1928; Volume II, 1927; Volume III, 1929; Volume IV, 1936. Price of each volume, Rs. 6

THESE four volumes form part of a series of ten volumes to be published on this subject of Indian chemistry and alchemy. In all these volumes the original Sanskrit text is first quoted and this is followed by an English translation. Volume I deals mainly with mercury, its attributes, purification, different operations with the metal, different preparations of mercury and their uses, as well as the description of some of the apparatus used. Some processes for the transformation of base metals into silver and gold are also described.

Volume II deals with inorganic compounds like mica, pyrites, saltpetre, salts of copper and iron, calamine, sulphur, sulphides of arsenic, antimony and mercury and metals like gold, silver and copper. The therapeutic uses of all the preparations are mentioned under each head. Volume III deals with the preparations and uses of metals like iron, zinc, tin and lead, alloys like brass and bell-metal, gems like diamond, emerald, ruby, pearl, sapphire, quartz, coral, amethyst, etc., alkalies, inorganic salts, inorganic and organic poisons and semi-poisons, and finally about some alcoholic liquors.

Volume IV starts with diet, dress, bath, etc., and passes on to different diseases and their treatment. Different kinds of fever, fever with diarrhoea, chronic diarrhoea, cholera, piles and diseases affecting the abdomen are all discussed and their treatment suggested. The methods of preparation of the medicines used are given in some detail and in some cases the necessary diet is also suggested. These medicines, which are mostly inorganic in nature, are taken with different adjuncts as is the custom in indigenous systems.

In compiling these volumes, the author has taken a lot of pains to collect much useful information in a form convenient for a wider section of the public both in India and abroad and he has thus earned the gratitude of all by this monumental work.

S. G.

**A SYNOPSIS OF THE BRITISH PHARMACOPŒIA, 1932, AND OF THE POISON LAWS OF GREAT BRITAIN, NORTHERN IRELAND AND THE IRISH FREE STATE INCLUDING THE 1936 POISONS LIST AND RULES.**—By H. W. Gadd. Thirteenth Edition. 1936. (With a Synopsis of the Addendum, 1936, to the British Pharmacopœia, 1932.) Baillière, Tindall and Cox, London. Pp. 200. Price, 3s.

THIS is the fourth appearance of this valuable little book since the publication of the 1932 British Pharmacopœia. In the present edition a synopsis of the Addendum of the British Pharmacopœia of 1936 is included.

The book contains all essential details of the composition, strength and dosage of all pharmacopœial drugs arranged in tabular form for quick reference, and other valuable tabulated information on weights and measures, the preparation of alcoholic solutions, etc.

It is a small volume that will easily go into the waistcoat pocket, and will be found invaluable for ready reference by both pharmacists and doctors.

**TUBERCULOSIS, CANCER AND ZINC: AN HYPOTHESIS.**—By D. B. Cruickshank, L.R.C.P. & S., L.D.S. (Edin.), D.P.H. (Camb.). 1936. Medical Publications Limited, London (25, Soho Square, W.1). Pp. xv plus 75. Illustrated. Price, 7s. 6d.

THE more widespread a disease, the greater the number of angles from which it can be envisaged. Tuberculosis and cancer, as diseases confined neither to man nor to specific areas of the globe, can certainly claim pre-eminence in this respect. The thesis of the author is that the relative incidence of these two maladies is inversely proportional, i.e., where one is high the other is low. He claims to show that in areas where the strata is rich in zinc or among zinc workers the incidence of tuberculosis is low, while that of cancer is high. Cancerous tissue appears also to have a relatively high content of zinc. The book is well written and should be read by those interested in the subject.

H. E. C. W.

## Abstracts from Reports

**ANNUAL REPORT OF THE UNION MISSION TUBERCULOSIS SANATORIUM, AROGYA-VARAM, NEAR MADANAPALLE (SOUTH INDIA), 1935-36**

THE report gives a short history of the origin of the sanatorium, its situation, climatic conditions, accommodation and other activities.

During the year 642 patients were treated, 421 were admitted and 422 were discharged. The group of 'merchants' contributed to the highest number (65),

the 'students' next (58). In the age group the highest number was in men between 21 to 30 years and in women 21 to 25 years.

Of the 422 cases discharged, 371 were suffering from active pulmonary tuberculosis. Of these, 51 were not included in the assessment for insufficient stay. The remaining 320 cases dealt with showed 14.4 per cent in stage I, 13.4 per cent in stage II, and 72.2 per cent in stage III. Amongst all these 56 were 'arrested', 110 'much improved' and 61 'improved' by the treatment,



that is 'positive' results were obtained in 70.9 per cent. In the stage I cases 98.0 per cent, in stage II cases 90.7 per cent and in stage III cases 61.5 per cent showed positive results. In these 320 cases sputum was found to be positive in 73.1 per cent. All those in stage I could be made free from the bacilli. The sputa of 56.5 per cent of those in stage II and 29.9 per cent of those in stage III could be made negative to the bacilli.

In the pneumothorax group (94) 'positive' results were obtained in 54.3 per cent. The author is very much impressed by its effect even in stage III cases. In this group in successful cases 50 per cent were much improved whereas in unsuccessful cases due to adhesions only 26.1 per cent were much improved.

The author has found encouraging results in intestinal tuberculosis cases by ultra-violet and vitamin therapies.

The most illuminating part of this report is the result of the investigation of after-histories of his cases. He clearly showed the advancement in the treatment of tuberculosis by modern methods. Amongst those treated during the years of 1915 to 1920, only 23.1 per cent were discharged as 'clinically well' and 35.5 per cent were alive and well after five years, whereas those treated during the years of 1926 to 1930, 34.3 per cent were discharged as 'clinically well' and 64.6 per cent were alive and well after five years. The group of 1921 to 1925 produced intermediate results. The groups of 'arrested' and 'much improved' were termed as 'clinically well', because the author found from after-histories of his cases that both those groups did equally well after their discharge from the sanatorium.

P. K. S.

#### THE RAMAKRISHNA MISSION FREE TUBERCULOSIS CLINIC, DARYAGUNJ, DELHI. REPORT FOR THE PERIOD OCTOBER 1933 TO DECEMBER 1935

*History.*—The institution was started in a small rented house at Pahargunj in October 1933. Shortly afterwards it was noticed that most of the patients were coming from the city proper. The clinic was, therefore, moved to a larger house near Jama Masjid in August 1934. This place was also found unsuitable and in September 1935 the management transferred the clinic to the present building known as 'Hanging Bridge', close to Daryagunj Post Office. It is a spacious, well-ventilated and well-lighted building very suitable for an institution of this nature.

*Objects.*—Before the introduction of the new scientific methods, such as collapse therapy, sanatoria were considered to be the only places where this disease could be treated effectively, but medical opinion has changed considerably in recent years. Even comparatively advanced cases can now be treated successfully in an outdoor clinic. The object of this small institution is to offer the advantages of the most modern forms of treatment to poor consumptive patients.

*Necessity of a tuberculosis clinic in Delhi.*—Once a civil surgeon of Delhi stated at a meeting of his colleagues that there was hardly a family in the city, which could claim to be altogether free from this disease in an active form. We have reason to think that he was not far from the truth. Under the circumstances it is impossible for a hospital with 70 or 100 beds to cope with the situation. We believe that outdoor clinics serve several purposes. Firstly, they treat those patients who do not obtain admission in the hospital. Secondly, the treatment of the patients discharged from the hospital can be continued in a clinic. Besides these two classes of patients, there is another class who will not go into a hospital. They also can have treatment in the clinic. Further, an outdoor clinic is the most suitable place for carrying out preventive work, which is the most important thing in fighting the disease.

*Equipment.*—The clinic is equipped with the instruments and apparatus to do artificial pneumothorax and phrenicectomy operations. Several such operations have already been performed in this clinic.

*Management.*—The institution is managed by a working committee appointed by the local committee of the Delhi Ramakrishna Mission.

*Maintenance.*—In its earlier days, the clinic was maintained by monthly subscriptions and small donations from the general public. Subsequently, a grant-in-aid of Rs. 1,050 from the King George Thanksgiving (Anti-Tuberculosis) Fund and lump sum donations, such as Rs. 2,000 from the Maharaja of Vizianagram, Rs. 500 from Seth G. D. Birla, and Rs. 500 and Rs. 300 from two anonymous donors, have so far enabled this useful institution to carry on the work. Unfortunately the monthly subscriptions have gradually fallen to an insignificant amount. As a result, the recurring expenses are being met from the donations. Consequently, the sum acquired from donations has been sadly depleted and unless other sources of revenue are made available it will be very difficult, if not impossible, for the clinic to continue its existence much less make the badly-needed expansion.

It is very difficult to secure a suitable house for an institution of this nature. Most house-owners are afraid of the word tuberculosis; so we always feel a sense of insecurity of tenure. For this reason in particular, there is urgent necessity for the clinic to have a building of its own. In such an event, current expenditure will be reduced considerably and it will add to the stability of the institution.

Besides a house of its own, the clinic has other requirements, such as an ultra-violet ray apparatus, an operating table, a sterilizer, a microscope and other ordinary laboratory requisites.

Through the kind offices of Lieut.-Col. W. C. Paton, C.M.O., and the ungrudging services of Dr. S. C. Sen and Dr. A. C. W. Dessa, x-ray examinations of our patients are being done either free or at a nominal cost. The work is rapidly increasing and it is likely that in the near future these gentlemen may find it impossible to meet the demands of our work. Hence it may be necessary for us in the near future to install an x-ray set.

At present all laboratory examinations, including routine examinations, are being done by Dr. S. K. Sen, free of charge. It is too much to ask him to continue this help for long. We feel the necessity of a small laboratory of our own, equipped well enough for doing the routine examinations of sputum, urine, etc.

*Preventive work.*—This disease spreads mostly by direct contact. Hence the most important part of preventive work lies in tracing patients suffering from the disease, and their contacts. This task becomes easy in an outdoor clinic. Further, as these patients get treatment in the clinic, they are under some obligation to the institution, and the staff gradually gain their confidence. As a result, these patients and their relations are not likely to raise objections to us visiting their houses and adopting such measures as are deemed necessary for carrying on the preventive work.

In 1934 the clinic obtained a grant-in-aid of Rs. 1,050 from the King George Thanksgiving (Anti-Tuberculosis) Fund for this purpose. A paid lady doctor was engaged specially for this work. Unfortunately, the grant was discontinued next year on the ground that a lady health visitor was not employed for doing the work. No lady health visitor was available at that time in spite of every possible effort on our part to secure one. The services of the lady doctor had to be dispensed with for want of funds.

Subsequently, owing to the rapid increase of patients attending the clinic, the honorary staff found it impossible to pay adequate attention to preventive work. At present, excepting the distribution of booklets—'Instructions to Tuberculosis Patients'—and the giving of verbal instructions to the patients and their contacts, very little is being done in this direction.

## Correspondence

## ADRENAL CORTICAL EXTRACT IN CHOLERA

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—I shall be very thankful if you will please publish this letter in your Journal.

I tried adrenal cortical extract (eucortone) in a few cases of cholera with very encouraging results. As the number of cases was very few, and it is not likely for me to get a large number of cases to try the drug, I beg to suggest to those who are treating large numbers of these cases to try this drug and give their opinions. I have ample reason to believe that it may prove a very valuable adjunct in the treatment of this disease.

Thanking you,

Yours, etc.,

P. C. DUTTA,  
CAPTAIN, I.M.S.,  
Civil Surgeon

SHAHPUR,

PUNJAB,

1st March, 1937.

THE SIGNIFICANCE OF A HIGH INCIDENCE OF *XENOPSYLLA BRAZILIENSIS* BAKER

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—In the course of a rat-flea survey of a few towns in the Travancore State, I happened to note an unusually high incidence of *Xenopsylla braziliensis* Baker, particularly in one locality, viz, Athirampuzha, a typical rural inland conservancy town, situated at an elevation of about 100 feet above sea-level, enjoying a fairly warm climate. The area surveyed comprises chiefly the market, grain-stores and a few thatched houses. Six hundred and forty-three rats were trapped and 1,444 fleas were caught off them. Twenty per cent of the fleas were identified to be *Xenopsylla braziliensis* as against only  $\frac{1}{2}$  per cent of *Xenopsylla cheopis*, from the same collection. For the sake of comparison and contrast, an area about half a mile from Athirampuzha and included within the same conservancy limits, consisting mainly of residential premises only, was also marked out and a survey almost in continuation of the above one showed cent per cent of *Xenopsylla astia*. It was therefore surmised that *Xenopsylla braziliensis* is not indigenous, that it thrives in close association with grain, and that its importation is the result of commercial intercourse. From the available literature at my disposal, it would appear that its distribution is very limited in Southern India, except in the Mysore plateau, where probably conditions are very suitable for its multiplication. I should therefore like to invite the opinion of your readers as to the special significance, if any, of such a high incidence of *Xenopsylla braziliensis*.

Yours, etc.,

R. SUNDARAM, M.B., B.S.,  
Assistant Surgeon,  
Medical Entomology,  
Northern Circle.

KOTTAYAM

(TRAVANCORE STATE),  
28th February, 1937.

## Service Notes

## APPOINTMENTS AND TRANSFERS

MAJOR-GENERAL E. W. C. BRADFELD, C.I.E., O.B.E., Surgeon-General with the Government of Bombay, is appointed to officiate as Director-General, Indian Medical Service, from the afternoon of the 13th February, 1937, vice Major-General Sir Cuthbert Allan Sprawson, K.L., C.I.E., K.H.P., granted leave.

Major-General W. H. Hamilton, C.I.E., C.B.E., D.S.O., has been appointed to be Deputy Director of Medical Services, Northern Command, from 9th February, 1937, vice Major-General A. W. M. Harvey, C.B., K.H.S., retired.

The services of Lieutenant-Colonel R. E. Flowerdew, C.I.E., Inspector-General of Prisons, Bengal, are re-placed at the disposal of the Government of India on the expiry of the leave already granted to him.

Lieutenant-Colonel T. C. Boyd, Officiating Surgeon-General with the Government of Bengal, on relief, reverts to his duties as Principal, Medical College, Calcutta, from the 28th February, 1937.

Lieutenant-Colonel J. C. De, Officiating Principal, Medical College, and Superintendent, Medical College Hospitals, Calcutta, reverts to his duties as Superintendent, Campbell Medical School and Hospitals, Calcutta, from the 28th February, 1937.

Lieutenant-Colonel S. Nag, Superintendent, Mymensingh Jail, handed over charge of his office to Dr. Ananta Mohan Dutt in the forenoon of the 4th January, 1937, and the latter handed over charge of his office to the former in the forenoon of the 12th January, 1937.

Lieutenant-Colonel A. H. Shaikh is appointed Deputy Director-General, Indian Medical Service, with effect from the 15th January, 1937.

Lieutenant-Colonel H. S. Cormack, M.C., Medical Superintendent and Ophthalmic Surgeon, General Hospital, Rangoon, is appointed to officiate as Inspector-General of Civil Hospitals, Burma, vice Colonel N. S. Sodhi, granted leave.

Lieutenant-Colonel R. H. Candy, Civil Surgeon and Superintendent, B. J. Medical School, Poona, is appointed to officiate as Surgeon-General with the Government of Bombay, with effect from the forenoon of the 10th February, 1937, pending assumption of charge by Colonel H. C. Buckley.

Lieutenant-Colonel J. S. Galvin is appointed, on return from leave, as Officiating Civil Surgeon, Nasik, vice Major J. E. Gray, proceeding on leave.

The Secretary of State for India in Council has appointed to the Civil Branch of the Indian Medical Service the following officers of the Indian Medical Service, with effect from the dates stated against their names:—

Major R. C. Wats. Dated 6th March, 1936.

Major D. MacD. Fraser. Dated 22nd January, 1936.

Major J. E. Gray. Dated 1st February, 1936.

Major T. A. Doran. Dated 11th June, 1936.

Major S. Smyth. Dated 1st April, 1936.

Major G. J. Joyce. Dated 18th June, 1936.

Major J. F. Shepherd. Dated 11th June, 1936.

Captain H. Min Sein. Dated 26th February, 1936.

The services of Captain L. Dass are placed temporarily at the disposal of the Government of Madras for employment in the Jail Department, with effect from the date on which he assumes charge of his duties.

On reversion from foreign service under the Indian Research Fund Association, Captain M. L. Ahuja, an officer of the Medical Research Department, is appointed to officiate as Assistant Director, Central Research Institute, Kasauli, from the date on which he assumes charge of his duties.

Captain M. Jafar is appointed temporarily as a supernumerary officer in the Port Health Department,

Bombay, with effect from the afternoon of the 20th January, 1937.

The services of Captain R. De Soldenhoff are placed temporarily at the disposal of the Government of Bombay, from the forenoon of the 28th January, 1937.

The undermentioned appointments are made:—

*To be Captain (on probation)*

Alley Henry O'Malley. Dated 28th December, 1936, with seniority as Lieutenant 25th September, 1930, and as Captain 25th September, 1933.

*To be Lieutenants (on probation)*

Albert Matthew McGavin. Dated 28th December, 1936, with seniority 28th December, 1935.

James Douglas O'Shaughnessy. Dated 28th December, 1936, with seniority 28th December, 1935.

James Edward O'Donnell. Dated 28th December, 1936, with seniority 28th December, 1935.

Donald Robert Cattanaeh. Dated 28th December, 1936, with seniority 28th December, 1935.

The following appointments are made to the Temporary Commission of the Indian Medical Service (Indian Land Forces):—

*To be Lieutenants*

Sleem Ahmad Mian. Dated 29th October, 1936.

Vishwanath Prasad Gupta. Dated 15th November, 1936.

Indubaran Mallik. Dated 7th December, 1936.

Mahankali Seetharama Rao. Dated 9th December, 1936.

Parshotam Dass. Dated 11th December, 1936.

Sayed Ahmad Hassan. Dated 22nd December, 1936.

Sailendra Mohon Basu. Dated 4th January, 1937.

LEAVE

Colonel N. S. Sodhi, M.C., Inspector-General of Civil Hospitals, Burma, is granted leave on average pay for 3 months, with effect from the 15th February, 1937, or the subsequent date on which he avails himself of it.

The Notification, granting leave to Lieutenant-Colonel E. C. A. Smith, Superintendent, Central Mental Hospital, Yeravda, with effect from the 5th March, 1937, is cancelled.

PROMOTIONS

*Colonel to be Major-General*

W. H. Hamilton, C.I.E., C.B.E., D.S.O., K.H.P. Dated 9th February, 1937.

*Lieutenant-Colonel to be Colonel*

A. F. Babonau, C.I.E., O.B.E. Dated 9th February, 1937, with seniority from the 2nd February, 1931.

*Majors to be Lieutenant-Colonels*

D. Sanyal. Dated 5th January, 1937.

S. M. A. Faruki. Dated 6th January, 1937.

B. E. Gadgil. Dated 6th January, 1937.

D. P. McDonald. Dated 9th January, 1937.

A. N. Sharma. Dated 12th January, 1937.

P. N. Basu. Dated 16th January, 1937.

J. J. Rooney. Dated 22nd January, 1937.

*Lieutenant (on probation) to be Captain (on probation)*

J. G. Thomson. Dated 11th November, 1936, with seniority from 1st May, 1936.

RETIREMENTS

The undermentioned officers retire:—

Lieutenant-Colonel J. J. Harper-Nelson, C.I.E., O.B.E., M.C. Dated 12th January, 1937.

Lieutenant-Colonel F. W. Hay. Dated 29th January, 1937.

RESIGNATION

Captain K. Cunningham has been permitted to resign his appointment, with effect from the 17th January, 1937, subject to His Majesty's approval.

## Note

### THE CORONATION

A CONSIDERABLE number of medical men will visit the home country for the Coronation, and whilst in England will naturally wish to take the opportunity to familiarize themselves with recent developments in all branches of their calling.

British manufacturers of medical equipment will most cordially welcome any opportunity they may be afforded to acquaint visitors with their latest productions.

Messrs. Watson and Sons (Electro-Medical), Limited, the well-known manufacturers of x-ray and electro-medical apparatus, desire us to make known the fact that they will be very pleased to escort visitors over their new factory at Wembley, Middlesex. This factory is equipped on most ambitious lines and is producing apparatus for the world market on a scale infinitely larger than has been attempted in the past.

Those desirous of availing themselves of this invitation should get into touch with Watsons at their London Office—Parker Street, Kingsway—when they will arrange for an escort to accompany them to Wembley.

## Publishers' Notice

SCIENTIFIC Articles and Notes of interest to the profession in India are solicited. Contributors of Original Articles are entitled to receive 25 reprints *gratis*; additional reprints can be obtained on payment. No reprints will be supplied unless contributors ask for them at the time of submitting their manuscripts.

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## Original Articles

### THE TREATMENT OF OPIUM HABIT WITH LECITHIN AND GLUCOSE

By R. N. CHOPRA, C.I.E., M.A., M.D. (Cantab.),  
M.R.C.P. (Lond.)

BREVET-COLONEL, I.M.S.

Honorary Physician to H. M. the King  
and

G. S. CHOPRA, M.B., B.S. (Punjab)

(From the School of Tropical Medicine, Calcutta, Drug  
Addiction Series, I. R. F. A., No. 24)

IN this paper we have recorded certain observations on the treatment of addiction to opium with lecithin and glucose which has been tried by us in the Carmichael Hospital for Tropical Diseases during the past two years. Following the lead given by our biochemical and biophysical studies (unpublished) we have treated a series of 80 patients, by the method described below, in the hospital and 120 cases in the outpatient department; these patients were taking doses of opium ranging from 10 grains to 200 grains a day. The results obtained by us have been so satisfactory that we now venture to publish them and commend them to the notice of those who have to deal with the difficult problem of getting addicts rid of this terrible drug habit.

#### *The treatment*

The procedure adopted by us was as follows:

When the patient presented himself for the treatment he underwent a thorough physical and biochemical examination. His name, age, sex, religion, occupation, social status, salary, etc., his mode of life, duration of habit, general health, weight, condition of the heart, lungs, bowels, etc., were recorded. He was told that he would undoubtedly have some discomfort, but it was impressed on him that it would not be more than he could bear, that his co-operation was absolutely essential at every stage of the treatment, and that much depended upon himself.

With a view to determining the rationale of the treatment the blood was examined for lecithin, cholesterol, blood sugar, blood calcium and for the non-protein-nitrogen contents before commencing the treatment. These examinations were repeated during the withdrawal period and after the completion of the treatment.

The condition of the heart was ascertained by taking an electrocardiograph during all the three above stages. The patients were photographed before and after the treatment in order to mark the changes in their general condition and expression. A careful record of the weight was kept throughout their stay in the hospital. The urine was examined for morphine contents daily in order to determine when the patient became drug free after withdrawal was effected. The water content of the blood plasma was

determined before, during withdrawal and after the treatment.

On the evening before the treatment was started the patient was given a dose of calomel (4 to 5 grains) followed by a saline purgative the next morning. The drug was then suddenly and completely withdrawn and the patient was watched for the development of withdrawal symptoms, which in the majority of cases started on the same day and attained their maximum within 24 hours. The actual treatment was formerly started when the withdrawal symptoms became intense and unbearable in order to study the biophysical and biochemical changes which are produced in the individual during this period. Lately it has been found distinctly advantageous to start lecithin and glucose the day before opium is withdrawn.

When these preliminary investigations were completed, lecithin (ovo lecithin Merck) was given by the mouth (Ma Wen-Chao, 1932), one pill containing 10 grains three times a day, and continued usually for five consecutive days. There is no doubt that in the majority of cases lecithin decreased the intensity of the withdrawal symptoms and shortened their duration. In spite of its administration in some of the patients the abstinence symptoms were severe and in these cases intravenous injections of 25 c.c.m. of 25 per cent glucose as well as glucose by the mouth greatly helped to ameliorate the condition. These were given with a view to stacking the liver with glycogen and in order to enable it to cope with the strain, which no doubt falls on this organ, during the process of elimination of morphine and other alkaloids of opium from the system. An intravenous injection of glucose was usually given every morning for the first three or four days, and if necessary was repeated in the evening. The injections were then stopped and glucose if still required was given by the mouth. No further treatment was required after the first week. No other drug was necessary during this period except a brisk saline purgative every morning to help in the elimination of the alkaloid through the gastrointestinal tract.

The diet during this period was light because patients, as a rule, cannot take much on account of the gastro-intestinal disturbances produced by the withdrawal. Glucose, milk, and fruit juices were given freely by the mouth for the first two or three days during the withdrawal period. On the fourth day when the abstinence symptoms began to disappear and the appetite returned a diet rich in proteins and lecithin in the form of eggs, milk, beans, fish, chicken and fruits, bread and butter was given.

After the completion of the actual treatment, that is after the complete withdrawal of the drug, the patients were further kept under observation in the hospital for a fortnight or

more. A twenty-four-hour specimen of urine was examined for the presence of morphine in order to see if any one of these patients was taking the drug secretly. In the ordinary course of events the alkaloid could be detected in the urine for four to five days after the withdrawal of opium and after that they could not be detected\*. If after this period the alkaloids were still found it was presumed that the patient was taking the drug. If the repeated examinations of the urine showed the absence of alkaloids it was concluded that the drug was no longer being taken and the habit was cured.

In order to effect a permanent cure we carried out a complete overhaul of every patient with a view to determining if any septic or toxic foci were present in the body, as morbid conditions of this kind are a common cause of opium addiction in this country. If routine laboratory examinations revealed such conditions, *e.g.*, dysentery, sprue, helminthiasis, sinusitis, conjunctivitis, etc., these were treated during the period of observation after treatment.

All patients after they were discharged from the hospital were kept under observation in their homes through their friends and relatives, for a period varying from four to 12 weeks or longer in order to rehabilitate and change them to new narcotic-free environments and to watch for any relapse. They were asked to report every fortnight with a specimen of urine, which was examined for the presence of opium alkaloids. The period of rehabilitation and rebuilding of the personality of an addict may sometimes extend to six months according to the original make up of the addict. This after-treatment is very important in order to prevent a relapse and should not be neglected.

#### *Symptomatic treatment*

The following is a brief summary of the symptoms and complications which may arise in the course of treatment and how to cope with them.

\*For the detection of morphine in the urine the method of Deckert (*Klin. Woch.*, 15, 697, 1937) was followed:

Ten c.cm. of the urine is heated with 0.3 gm. of  $\text{Na}_2\text{CO}_3$  until the first bubbles rise and is then quickly cooled. It is then transferred to a separating funnel and thoroughly shaken with 10 c.cm. of acetic ether. After the layers have separated, the acetic-ether layer is transferred to a small porcelain dish through a filter-paper and evaporated to dryness on a water-bath. The residue is diluted in 0.25 c.cm. of water with one drop of nitric acid (sp. gr. 1.15) and a drop of 10 per cent ammonium molybdate solution added. After careful whirling of the porcelain dish, the contents are filtered through a compressed cotton plug placed in the upper part of the neck of a funnel. The dish is rinsed with two successive quantities of water (0.25 c.cm. and 0.15 c.cm.) which is passed through the filter. The cotton plug is then pressed down to the lower opening of the funnel, so that no filtrate remains in the funnel. A drop of 2 per cent solution of ammonium vanadate is then added and well mixed. Depending on the morphine content a turbidity develops.

(i) *Pains in the body and limbs, cramps and general malaise.*—The first two were very troublesome and often did not yield to ordinary analgesics; cramps were commonly met with but they were not very severe. Simple measures, such as massage, hot baths, aspirin and veramon, may succeed, but when the pain is severe an intramuscular injection of novalgin (Bayer) 2 c.cm. often proved effective. Hyoscine hydrobromide in 1/200 grain doses was also tried but was not found to be effective in controlling these symptoms. The pains and cramps generally disappeared in three to four days after the administration of lecithin and glueose.

(ii) *Nausea and vomiting* were common symptoms and were observed in 40 per cent of this series. In twenty cases there was actual vomiting and in two cases it was very severe and incessant. Sucking of ice greatly relieved these symptoms and in severe cases 10 drops of adrenaline hydrochloride (strength 1 in 1,000 in normal saline) under the tongue every two to four hours often gave relief.

In two patients severe bilious vomiting occurred and the stomach had to be washed out with a solution of sodium bicarbonate (one drachm to a pint of water) after which the patients were relieved.

(iii) *Constipation and diarrhoea* were treated with administration of saline every morning and if necessary calomel in half grain doses was given the previous night. Diarrhoea is also frequently met with and for this condition no special treatment is given except fluid diet and withholding the daily dose of saline. In severe cases bismuth and chalk mixture may be given.

(iv) *Cardiovascular manifestations.*—There were feeble and irregular pulse, sinking sensations, cardiac embarrassment and collapse. These symptoms were greatly relieved by administration of glucose by the intravenous route and cardiac tonics, such as brandy, cardiazol, digitofortis, etc., were effective. Special treatment for the heart condition had to be resorted to in ten cases. They were all aged persons who had been taking the drug for over 20 years and in doses above 40 grains a day and showed severe reactions during the period of abstinence. In one patient, an old man, aged 65 years, who had been taking the drug in doses of 45½ grains for a period of 40 years, collapse occurred on the fourth day of withdrawal owing to excessive loss of fluid, due to persistent bilious vomiting and diarrhoea. The treatment adopted was intravenous administration of four to five pints of glucose saline, cardiazol and atropine sulphate injections and brandy by the mouth. No opium was given. This patient was discharged from the hospital as cured after 21 days.

(v) *Vasomotor disturbances such as sneezing, coughing and running from the nose and eyes.*—Unless severe these require little or no treat-



ment but, when troublesome, a small dose of Dover's powder (5 grains) at bedtime gives relief.

(vi) *Spermatorrhœa* was treated by the following simple mixture containing potassium bromide 10 grains, ammonium bromide 10 grains, ammoniated tincture of valerian 30 minims and chloroform water up to one ounce. This mixture was given twice daily; it allayed restlessness and induced sleep. We allowed this mixture to be taken after the patient was discharged from the hospital in cases where there were signs of restlessness and irritability.

(vii) *Insomnia*.—This was a very troublesome symptom and was often difficult to treat. It generally started early in the course of treatment and sometimes continued for weeks. We often gave no treatment for this condition for a day or two, the patient being instructed to exercise his own will power and try to sleep. Sometimes he was helped by such simple measures as a hot foot bath before retiring or a dose of mixture containing bromides at bedtime. When these measures failed a pill containing  $7\frac{1}{2}$  grains of medinal administered at bedtime often succeeded in producing sleep for four to six hours. This produced a real change in the patient's mental condition and attitude as he began to feel rested and gained confidence in the efficacy of the treatment. This drug should not be repeated for more than four successive nights. Other barbiturates and hypnotics, such as adaline, cvipan, luminal, ortal (Parke, Davis & Co.), were tried with good results. In one serious case of intractable insomnia where nothing succeeded 30 minims of tincture of *Rauwolfia serpentina* was successful in producing sleep.

(viii) *General asthenia and loss of appetite*.—For anorexia, which was a common symptom during the first week or so, a mixture containing gentian, alkalies and nux vomica before food was very useful. The general lassitude and weakness following withdrawal were relieved by a simple mixture containing iron, strychnine and arsenic which was usually prescribed to be continued for a few weeks after discharge from the hospital.

*Abstinence symptoms*.—We have already stated that in order to work out the rationale of the treatment all the patients were allowed to develop the withdrawal symptoms in full before starting the actual treatment. The most common symptoms recorded during this period among the opium addicts were as follows:—

Quite a number of patients suffered from cramps which were sometimes severe, epigastric pain, sinking sensation in the chest, insomnia, diarrhœa, vomiting, headache, backache, asthenia and inability to stand up and walk. A few patients taking large doses for prolonged periods developed feeble pulse, profuse perspiration, vomiting and severe diarrhœa, resulting in collapse. Spermatorrhœa and headache were

also common. Hiccough was observed in a few cases. Vasomotor disturbances, such as sneezing, coughing and running from the nose and eyes, were also commonly seen. Palpitation and cardiac distress were also observed in a few cases. Anorexia was a common symptom and usually there was no appetite for the first three or four days and all food was refused. Over 50 per cent of the patients suffered from insomnia which was often very troublesome. We observed that there was a good deal of psychological element in all these symptoms and the addict could control, to a large extent, the intensity of the withdrawal symptoms if he was strong enough to do so.

On the second day of the actual treatment most of the patients reported that the discomfort had decreased by half. In a number of cases the patient appeared to have developed a sort of dislike for the drug. When seen a few weeks after the treatment many reported that the drug had lost all its taste and charm and in some cases the very smell of it produced the sensation of nausea. The treatment undoubtedly gave rise in a number of cases to a definite feeling of aversion for the drug, whether by smoking or taking by the mouth. There appeared to be no doubt that in a large number of cases the craving for the drug was stopped and a cure was effected.

The mental outlook of the addicts also showed a remarkable change. After the treatment the persons who came sad and morose and apathetic, with pale and sallow complexion, developed cheerful and fresh countenance, ate well and improved in general health, and put on weight. They became more social, docile and respectful and showed inclination for work. They now felt interested in their surroundings and were observed to be even more active than other patients in the hospital. After discharge from the hospital it was ascertained that most of them had become useful members of society and followed their vocations with interest.

#### *Analytical study of the 200 cases treated*

*Present age of the addicts*.—It will be seen from a perusal of table I that the youngest addict cured was 20 years old and the oldest who offered himself for the treatment was 70 years old. The treatment proved to be more effective in those below 50 years of age. In this series 161 or 80.5 per cent of the addicts were below 50 years of age, only 39 or 19.5 per cent were above 50 years, and none above 70 years. The majority of addicts who underwent the treatment were between 31 and 40 years of age. The age of the addicts treated and its relationship with response to treatment have been represented in table I.

It will be seen that the younger addicts of this series gave the best results. Amongst those who were completely cured, 116 or 82.9 per cent were of the ages between 21 and 50 years,



TABLE I

Showing relationship between present age of addicts and response to treatment in a series of 200 opium addicts treated

Results	NUMBER OF ADDICTS TREATED CLASSIFIED ACCORDING TO THEIR PRESENT AGES							
	20 and under	21-30	31-40	41-50	51-60	61-70	71 and up	Total
Complete cure .. ..	1	116			18	5	Nil	140
		16	77	23				
			38					
Dose reduced by 50 to 80 per cent .. ..	..	3	20	15	10	2	Nil	50
			6					
Failure .. ..	..	1	3	2	2	2	Nil	10
		161						
Total number of cases treated .. ..	1	20	100	40	30	9	..	200

18 or 12.9 per cent between 51 and 60 and only 5 or 3.6 per cent were above 61 years of age. Similarly the reduction in dosage is effected much more easily in the young than in the old. The percentage of failures is more marked in advanced age than in young adults.

*Duration of the habit.*—A perusal of table II will show that there were only 5 per cent in this series who had taken the drug for a period up to 5 years; 24 per cent took it for 6 to 10 years and the majority of those cured were those who were addicted to the drug for periods varying from 11 to 20 years. There were 17.5 per cent who were addicted to it for periods varying from 21 to 30 years, and 2.5 per cent from 31 to 40 years. In this series there were only two persons who had taken the drug for over 40 years.

A perusal of table II will show that the treatment although more effective in patients with duration up to 20 years also works satisfactorily in those with longer duration. The maximum period of addiction recorded in this series was 41 years in two cases which showed complete cure.

*Daily dose.*—The daily dose of the addicts treated has been represented in table III. It will be seen that there were only five persons who took opium in doses up to 10 grains a day, while the majority (i.e., 120 or 60 per cent) took the drug in doses ranging from 41 to 100 grains a day. There were 20 individuals (10 per cent) who took above 100 grains a day. The maximum dose recorded in this series was 200 grains *per diem*. It will also be seen that

TABLE II

Table showing relationship between the duration of addiction and response to treatment in a series of 200 opium addicts treated

Results	5 years and under	6-10	11-20	21-30	31-40	41 and up	Total
Complete cure .. ..	9	24	80	23	2	2	140
Dose reduced by 50 to 80 per cent .. ..	1	22	18	8	1	..	50
Failure .. ..	0	2	2	4	2	..	10
Total number of cases treated .. ..	10	48	100	35	5	2	200

TABLE III

Table showing relationship between daily dosage and response to treatment

Results	DAILY DOSAGE IN GRAINS							Total
	10 grains and under	11-20	21-40	41-60	61-80	81-100	101 and up	
Complete cure .. ..	5	14	32	16	20	43	10	140
Dose reduced by 50 to 80 per cent .. ..	..	1	8	13	15	9	4	50
Failure .. ..	..	..	..	1	1	2	6	10
Total number of cases treated .. ..	5	15	40	30	36	54	20	200

the number of failures is more in the case of large doses, i.e., above 81 grains a day.

The following factors were said to be responsible for causing the habit in this series.

(1) Association or example	..	80
(2) Production of pleasure and euphoria	..	20
(3) Disease	..	100
Cough and sneezing	..	25
Asthma	..	5
Pain in joints	..	10
Spermatorrhœa	..	7
Hæmoptysis	..	2
Headache	..	12
Toothache	..	2
Piles	..	7
Diarrhœa	..	15
Epigastrie pain	..	5
Watering from the eyes	..	10

#### Duration of treatment

The actual time taken by treatment varies according to age, physical as well as mental condition of the addict and duration of the habit. In mild cases among young persons who are physically strong and with a duration of the habit of not more than 5 to 10 years, and dosage below 40 grains a day, a cure can be effected in 10 days and the patient can be discharged from the hospital. On the other hand, in the case of persons of somewhat advanced age, i.e., above 40 years and who were constitutionally weak with a duration of the habit above 20 years and dosage of above 40 grains a day, the period of treatment may be from two to three weeks. The duration of treatment appears to depend on age, dosage and tolerance. Those with a low tolerance are relieved more quickly than those who have developed a high degree of tolerance. Likewise those with high tolerance can never be cured unless they are willing gradually to decrease the opium intake and in certain cases the reduction is very low. As a rule the average case is cured within two weeks.

#### Results of treatment

The results obtained in this series have been tabulated in table IV.

From the table it will be seen that complete cure was effected in 140 or 70 per cent of our series. The dose was reduced by 80 per cent in 20 or 10 per cent and by 50 per cent in 30 or 15 per cent. The treatment failed completely in 10 cases or 5 per cent of the series. So far, the results are very encouraging, i.e., 70 per cent showed complete cure.

In this series of cases there were two opium smokers and one morphine addict. Quite a number of addicts also took hemp drugs and alcohol in addition to opium. That the treatment was popular is shown by the fact that addicts came from remote parts of India to Calcutta for getting rid of the habit.

#### Summary

1. A method of treatment of opium habit with lecithin and glueose tried in a series of 200 cases has been described.

2. The percentage of cure effected works out to 70. The results obtained are so satisfactory as to warrant a more extensive trial.

3. The lines of treatment are simple and may be tried in the addict's house if his faithful co-operation is ensured.

4. The cost of treatment is reasonable and it can be tried for mass treatment.

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TABLE IV  
Showing results of treatment

Results	Completely cured	DOSE REDUCED BY		Failure	Relapse within six months after discharge from the hospital
		80 per cent	50 per cent		
Cases treated .. ..	140	20	30	5	5
Percentage .. ..	70	10	15	2.5	2.5

## ANÆMIA IN TEA-GARDEN LABOUR FORCES

By L. EVERARD NAPIER, M.R.C.P. (Lond.)

*Acting Professor of Tropical Medicine  
Calcutta School of Tropical Medicine*

[This paper gives a short account of work carried out by the writer and his assistants in Calcutta and in Assam. The writer is a worker under the endowment of the Calcutta School of Tropical Medicine, but some of the work reported was financed by the Indian Research Fund Association.

The paper, in very much the same form, was read at the Annual General Meeting of the Assam Branch of the British Medical Association in January 1937.

A more complete account of this work will be found in the *Indian Journal of Medical Research*, volume XXII, p. 809, volume XXIII, pp. 305, 311, 455 and 973, volume XXIV, pp. 855 and 1159.]

In investigating the anæmias of tea-garden coolies, the first difficulty that we encountered was the complete absence of any reliable hæmatological data in the form of normal standards for Indians and in supplying these we were able to expose some popular misconceptions and to make a few observations that have not yet been fully explained; of the former the most striking was that the blood of the healthy well-nourished Indian is not 'thin', the hæmoglobin in the male being about 110 to 115 per cent. .

preferably 100, divisions, and an anticoagulant, e.g., potassium oxalate.

Blood is withdrawn from a vein, a definite, but not necessarily an exact, amount, say 5 c.cm.; this is put into a tube containing powdered oxalate—0.01 gramme for 5 c.cm. of blood. The blood and oxalate are mixed by spinning the tube between the palms of the hands. The oxalate blood is transferred to the graduated tube up to the top mark and centrifuged for 20 minutes. The level of the red cell is read off as a percentage of the whole and is multiplied by a factor, 1.09, to compensate for shrinkage of the cells. The normal is from 44 to 48 per cent.

Three other values are calculated :—

The mean corpuscular volume (MCV)

$$\frac{\text{Volume of packed cells per 1,000 c.cm.}}{\text{Red cells per c.mm. in millions.}}$$

The mean corpuscular hæmoglobin (MCH)

$$\frac{\text{Hæmoglobin in grammes per 1,000 c.cm.}}{\text{Red cells per c.mm. in millions.}}$$

The mean corpuscular hæmoglobin concentration (MCHC)

$$\frac{\text{Hæmoglobin in grammes per cent} \times 100.}{\text{Volume of packed cells per cent.}}$$

*Normal European standards.*—

MCV .. .. 87 cubic  $\mu$

MCH .. .. 29  $\gamma\gamma$

MCHC .. .. 33—35 per cent.

*Normal Indian standards.*—The means of a number of observations are given below :—

TABLE I

	Calcutta males	COOLIES		Pregnant females
		Males	Females	
Hæmoglobin, in grammes per 100 c.cm. ..	15.70	{ 11.83 } { 12.63 }	{ 10.03 } { 11.30 }	10.7
Red blood corpuscles, in millions .. ..	5.53	{ 5.35 } { 5.27 }	{ 4.55 } { 4.93 }	4.65
Cell volume, per cent .. ..	50.53	36.63	35.10	32.8
Mean corpuscular volume, cubic $\mu$ .. ..	90.49	71.29	72.30	72.1
Mean corpuscular hæmoglobin, $\gamma\gamma$ .. ..	28.53	23.93	23.35	23.8
Mean corpuscular hæmoglobin concentration, per cent .. ..	31.07	32.50	33.07	30.3
Number of observations on which means are based ..	30	24 and 18	17 and 16	40

At this point I think that I will explain a few terms that I shall use :—

*Hæmoglobin.*—The expression 100 per cent is really meaningless, as it may indicate anything from 13.8 grammes to 17.2 grammes per 100 c.cm. of blood. We therefore refer to hæmoglobin in grammes per 100 c.cm. of blood.

*Cell measurements.*—The halometer gives very misleading results, and the Price-Jones method is too laborious for routine use, so we used the packed-cell method for estimating cell volume; this requires an electric centrifuge that will do 2,000 revolutions at least, a small graduated tube with at least 50, and

### *Anæmic coolies from the general population*

We did a fairly complete hæmatological examination of 100 anæmic coolies selected from the general coolie population. They were selected clinically; a Tallqvist reading, taken by the assistant medical officer on the garden, below 50 per cent was taken as the criterion. They were examined in two groups, 58 in the first year; in these a subsequent examination was carried out after an interval of a few months, but no special treatment was given. The coolies were, however, given the usual routine anthelmintic treatment and put on ordinary

iron mixtures, but as most of them were out-patients, they probably took very little of this. The second group of 42 patients (subsequently reduced to 41 by a coolie absconding) was divided into six different groups, and each group was treated differently, but all were given an adequate course of ferrous sulphate.

*The pre-treatment findings in the second series*

I will not attempt to go into these in detail, but I will give a few figures from the data collected. The lowest hæmoglobin level was 2.5 grammes, and the mean corpuscular values were as follows :—

The conclusions at which we arrived in connection with these two series were as follows (I am quoting from a recent paper\*) :—

With very few possible exceptions the anæmia was of the microcytic-hypochromic type.

In no instance was the anæmia of the pernicious type.

The response to treatment with large doses of iron in 39 out of 41 cases in the second series makes it evident that this microcytic-hypochromic anæmia is an iron deficiency anæmia.

TABLE II

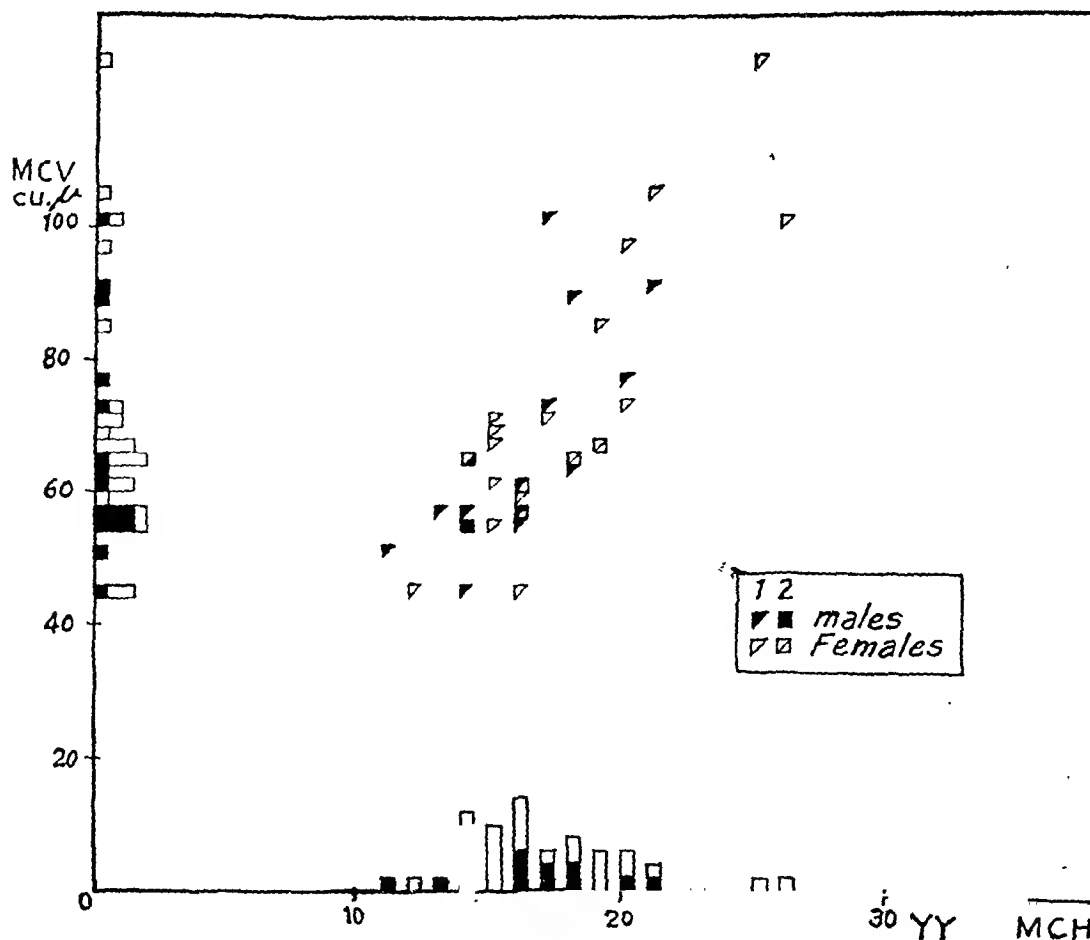
	Males	Females	All cases
Mean corpuscular volume (MCV) .. ..	65.75 cu. $\mu$	72.60 cu. $\mu$	69.72 cu. $\mu$
Mean corpuscular hæmoglobin (MCH) ..	16.17 $\gamma\gamma$	18.06 $\gamma\gamma$	17.23 $\gamma\gamma$
Mean corpuscular hæmoglobin concentration (MCHC)	25.62 per cent	25.60 per cent	25.61 per cent

This chart (chart I) represents the individual values; it will be seen that there is hypochromia in every instance and that the vast majority are microcytic as well, none being truly macrocytic.

*The cause of this iron deficiency. Actual deficiency in the diet.*—It is hard to make any estimate of the iron content of the coolies' diet.

\* *Indian Journ. Med. Res.* (1937), Vol. XXIV, p. 855.

CHART I



Showing the relationship between the mean corpuscular volume and the mean corpuscular hæmoglobin in 38 cases in the second series.

It is possibly poor in iron but there is strong evidence to suggest that it is richer in iron than that of many non-anæmic vegetarian communities; the absence of milk and the low fat consumption are the two most striking features in the coolie dietary. The water in the district contains a large quantity of iron, but the iron is in the ferric state.

*Failure of absorption.*—The fractional gastric analyses in 87 cases showed the presence of free hydrochloric acid in 80 cases without the administration of histamine. The incidence of achlorhydria is, thus, lower than in the normal population and the possibility that the iron deficiency is due to failure of absorption on this account is ruled out.

*Hookworm infection.*—A hookworm infection was demonstrated in nearly every case; in half the cases the hookworm infection was a heavy one. The type of hypochromic-microcytic anæmia from which these patients were suffering is, broadly speaking, the anæmia that is usually associated with hookworm infection.

An examination of random samples of stools taken from the normal coolie population shows almost a hundred per cent infection rate, but only about 14 per cent with a heavy infection (10,000 eggs or more per gramme).

On the other hand, we were unable to show any association between the degree of hookworm infection, as demonstrated by the egg-counts, and the degree of the anæmia.

The actual presence of a heavy infection does not prevent the hæmoglobin from recovering to a point above the normal level of the coolie population, nor does the persistence of a heavy hookworm infection appear to affect the degree of improvement in individual cases. But in the garden in which the treatment was least effective (Murmuria) the hæmoglobin level tended to fall during the last two months of observation, whereas in another garden (Nagadholie), in which the iron and dietary treatment had been almost the same but the hookworm treatment had been effective, the hæmoglobin continued to rise.

We can summarize our observations by saying that hookworm infection is almost certainly the main factor in the production of anæmia but that, as a normal hæmoglobin level is not incompatible with a heavy hookworm infection, there is probably some other factor that determines why anæmia occurs in some cases and does not in others.

*Associated factors in the production of anæmia. Malaria.*—The spleen index on the garden from which the coolies came varies from 28 to 39 per cent. The spleen was palpably enlarged in about one-third of the cases, but there is no correlation between the splenic enlargement and the degree of anæmia.

In more than a third of the cases there is hyper-bilirubinæmia; this is not a usual finding in simple hookworm anæmia. It suggests, either

(a) that there is some liver dysfunction, which seems unlikely as there is little other evidence of this, (b) that there is excessive hæmolysis, or (c) that the products of normal hæmolysis are insufficiently re-utilized, because of a deficiency in some other substance essential to normal hæmopoiesis.

Excessive hæmolysis suggests concomitant or recent malarial infection, and it does sometimes occur in cases of chronic splenic enlargements; in the first series, there was a comparatively high correlation between hyper-bilirubinæmia and splenic enlargement; this correlation was not however statistically 'significant', nor in the second series was there any evidence of such correlation.

Hyper-bilirubinæmia occurs in pernicious anæmia, where it is due to deficiency of the hæmopoietic principle, but does not usually occur in iron deficiency; if therefore the suggestion (c) above is to be valid there must be some other deficiency. In the second series, the incidence of hyper-bilirubinæmia is considerably reduced following treatment; this fact lends support to the suggestion that it was due to incomplete re-utilization of the products of normal hæmolysis.

The anæmia associated with either acute or chronic malaria does not present the picture of the anæmia with which we are dealing; as in malaria there is only intravascular or intracellular destruction of blood, there is not the same loss of iron from the body that occurs in hookworm anæmia.

*Diet.*—Though none of the coolies are indigent and all earn sufficient money to provide themselves and their families with an ample diet, there is little doubt that the diets on which they live are ill-balanced and deficient in good protein and in fat; there is little evidence of any vitamin deficiency except possibly of vitamin A.

An experiment was designed to see the effect of diet on the blood picture. Eight patients were kept for a period of 28 days on a well-balanced diet with a caloric value of about 3,500. In no one case did the blood picture improve and the mean hæmoglobin in the series was slightly lower at the end of the period (chart II). These patients were then given large doses of ferrous sulphate for three weeks and there was an immediate response; there was a mean increase of 6 g. in the hæmoglobin of the eight cases within a period of 28 days.

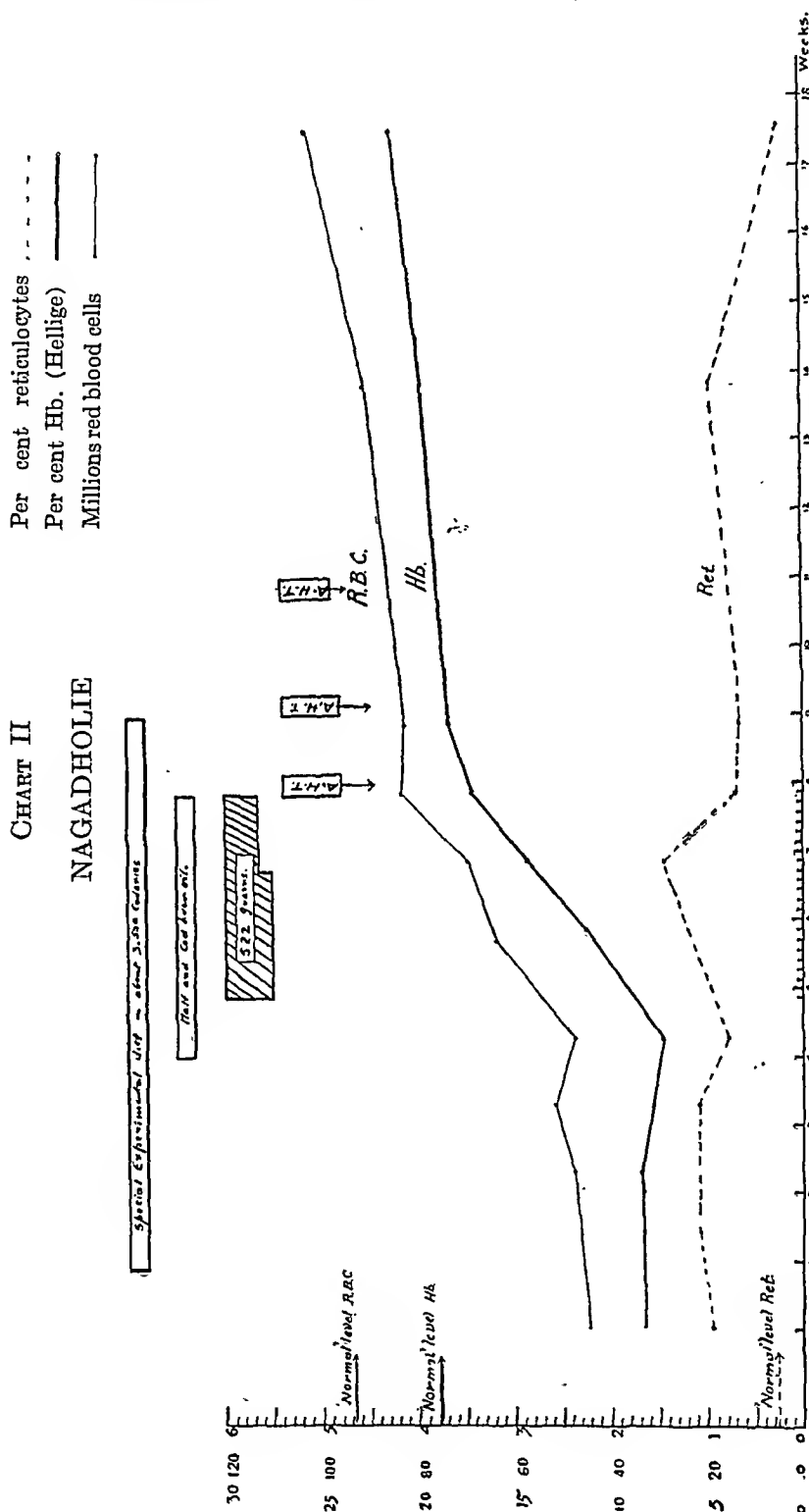
This experiment shows that dietary re-adjustment by itself will not effect an immediate improvement in the blood picture in cases in which anæmia is established. It does not, however, prove that a deficient diet does not produce a state in which the patient is susceptible to a degree of blood loss that in more favourable conditions would be easily compensated.

We must, however, conclude from the evidence here produced that dietary deficiency is not an

important factor in this particular type of anæmia.

*The unknown factor limiting the final hæmoglobin level.*—We have shown that, although in

Even starting from the higher hæmoglobin level of the 'normal' coolie, improvement beyond a certain point seems to be unattainable. If we look at the corpuscular values after treat-



nearly all the cases there was a marked response to treatment, there is some limiting factor which prevents improvement beyond a certain level, and that this level is not the level of the better-class, city-dwelling Indian.

ment it will be seen that the MCH and MCV are far below the normal, but that the MCHC approximates very closely to the normal. That is to say, the provision of iron has brought the cell contents up to the usual hæmoglobin



concentration, but there is still some factor which interferes with the blood-cell formation at the normoblastic level.

This deficiency, if it is a deficiency, appears to be common to the whole coolie population as the MCH of the first series of 'normal' coolies (22.2  $\gamma\gamma$ ) was even less than it is in this series.

The main factor in the production of anæmia in hookworm infection is the loss of blood and all its constituents. Iron is obviously a vital constituent and supplying this will bring the blood up to a certain level, but, in the circumstances of the above experiments, not back to normal.

In the anæmia following malarial infection the loss of blood is from the circulation and not from the body. In the process of hæmolysis the iron is saved and stored; we know something of the subsequent course of the blood pigments, but we know little about the fate of the other blood elements, and we do not know whether certain of these, that are not easily synthesized in the body and whose products are not stored, are not broken down during the process of hæmolysis.

Finally, though we have been unable to show that the anæmia can be cured by the provision of a good diet, we cannot be certain that long periods of deficient diet have not reduced the store of some essential factor for normal hæmopoiesis, so that the body is unable to meet the extra demand which is thrown on it by the long-continued blood loss of hookworm infection, and/or by blood destruction in repeated malarial infections.

#### *The results of different treatment procedures*

*The total dose of iron.*—The mean improvement during the first month was fairly constant in the first five groups and bore little relationship to the total iron dosage, but on the three gardens where the highest dosage was given the improvement was maintained.

This is a point that I have studied further in my ward cases in Calcutta. I always give a three weeks' course of 18 grains a day (378 grains) in the first instance and I have found that in about half the cases a further course is indicated and when given pushes the hæmoglobin level higher.

The results with the smallest dosage, 11 grains a day for three weeks, were very satisfactory indeed compared with those of treatment by anthelmintic and ordinary iron tonics, that was given in the first series.

*The effect of diet.*—The two groups in which a special diet was given were unfortunately those in which the largest dose of iron was also given, but these results were not quite as good as in the Katinibari group where no special diet was given, though the normal hospital diet is a good one. In the Sycotta group, where a very adequate dosage of iron was given and where the effect of hookworm treatment was very satisfactory, there was an early falling off in the

hæmoglobin level, and in the Kharikatia (b) group, where the diet was unsatisfactory, the results were poor; the results in these two groups do suggest, but not very forcibly, that diet has some effect on the maintenance of a high hæmoglobin level.

*Hookworm treatment.*—In the first series where for all practical purposes only hookworm treatment was given, except to those treated as hospital patients, the results were far below the worst results in the second series. It is therefore apparent that anthelmintic treatment alone will not effect a cure except possibly after a long interval.

It is quite obvious that almost maximal improvement can be achieved without anthelmintic treatment, and that in the presence of a heavy hookworm load a high hæmoglobin level can be maintained for some months (*vide* Murmura). On the other hand, it is quite certain that in time the hookworm infection will cause a recurrence of the anæmia; for example, in the Kharikatia (b) group, where a heavy infection was maintained, there was a marked fall in the hæmoglobin level even during the short period of observation of this experiment.

It seems to be a matter of little importance whether the anthelmintic treatment is given before or after the iron treatment from the point of view of the eventual result, but there are certain advantages in giving the treatment to a healthy rather than to an anæmic individual. In this investigation, some of the best results were achieved by giving the anthelmintic treatment first but so also were the worst results [*vide* Katinibari and Kharikatia (b), respectively].

A table summarizing the results of the different treatment procedures is given below.

#### *'Normal' pregnant women: another control series*

A series of 40 non-anæmic pregnant women was examined during the next year; the important data are given below, and also in table I.

#### *Pregnant women*

The next series that was investigated were 228 pregnant women taken from the 'pregnancy' parades. In this instance only the hæmoglobin was estimated, but this was done with some precision, usually in duplicate, with the Hellige apparatus.

The mean hæmoglobin of the series was 9.22 grammes, which is slightly but distinctly lower than the means in the two normal (female) coolie series, 10.03 and 11.30, respectively, but to obtain these latter figures we excluded all coolies below the 50 per cent level, as we considered these not normal but definitely anæmic; if we take the same arbitrary level we can divide these coolies into two groups, the anæmic group consisting of 36 women (that is to say, 15.8 per cent) and the 'normal' group of 192 women.

TABLE III

*Summarizing results of treatment on different gardens*

Group	Cases	Diet in calories approximately		Iron in grains	ANTHELMINTIC TREATMENT		MEAN HÆMOGLOBIN LEVEL AND TOTAL INCREASE, BEFORE, AND AFTER DIFFERENT PERIODS FROM COMMENCEMENT OF IRON TREATMENT			
					Before or after iron	Number of final egg-counts above 5,000	Before iron	A month	About two months	About three months
Nagadholie ..	7	Good	3,500	522	After	1	4.0	$\frac{10.1}{6.1}$	$\frac{10.9}{6.9}$	$\frac{11.7}{7.7}$
Murmuria ..	8	Good	3,500	540	After	5	3.9	$\frac{10.3}{6.4}$	$\frac{11.8}{7.9}$	$\frac{11.3}{7.4}$
Sycotta ..	6	Ordinary	2,200	360	After	0	5.1	$\frac{11.5}{6.4}$	$\frac{11.7}{6.6}$	$\frac{11.0}{5.9}$
Katinibari ..	6	Good	2,500	478½	Before	1	4.6	$\frac{11.4}{6.8}$	..	$\frac{13.0}{8.4}$
Kharikatia (a) ..	5	Ordinary	2,200	231	After	1	4.2	$\frac{10.2}{6.0}$	..	$\frac{10.0}{5.8}$
Kharikatia (b) ..	4	Poor, less than 2,000		275	Before	3	4.0	$\frac{9.1}{5.1}$	..	$\frac{7.7}{3.7}$

TABLE IV

*Forty normal women (pregnant)*

	Maximum	Minimum	Mean	Standard deviation
Hæmoglobin in grammes per 100 c.cm. ..	12.51	9.62	10.7	± 1.6
Red blood cells in millions ..	5.96	3.68	4.65	± 0.62
Cell volume ..	37.8	29.0	32.8	± 2.3
Mean corpuscular volume ..	90.2	59.4	72.1	± 8.1
Mean corpuscular hæmoglobin ..	29.5	18.2	23.8	± 2.9
Mean corpuscular hæmoglobin concentration ..	39.2	27.8	32.6	± 1.8
Reticulocytes ..	4.7	0.4	2.1	± 1.8

The mean hæmoglobin of the 'normal' group was 9.99 grammes which is remarkably near the figure 10.03 grammes which we found in the first series of the general female population. Amongst the general female population the incidence of definite anæmia (*i.e.*, below 50 per cent, or 6.9 grammes) was less than 10 per cent, so that there are obviously more anæmics amongst the pregnant women, although, if anæmics are excluded, the mean hæmoglobin level does not seem to be lowered by pregnancy. Further, there is no evidence of any progressive hæmoglobin deterioration throughout pregnancy. The anæmia is more frequently encountered in younger women and in the first pregnancy; these two facts are obviously interdependent.

Next, 52 pregnant anæmic women were examined, but in these a much more complete examination was carried out and in some a

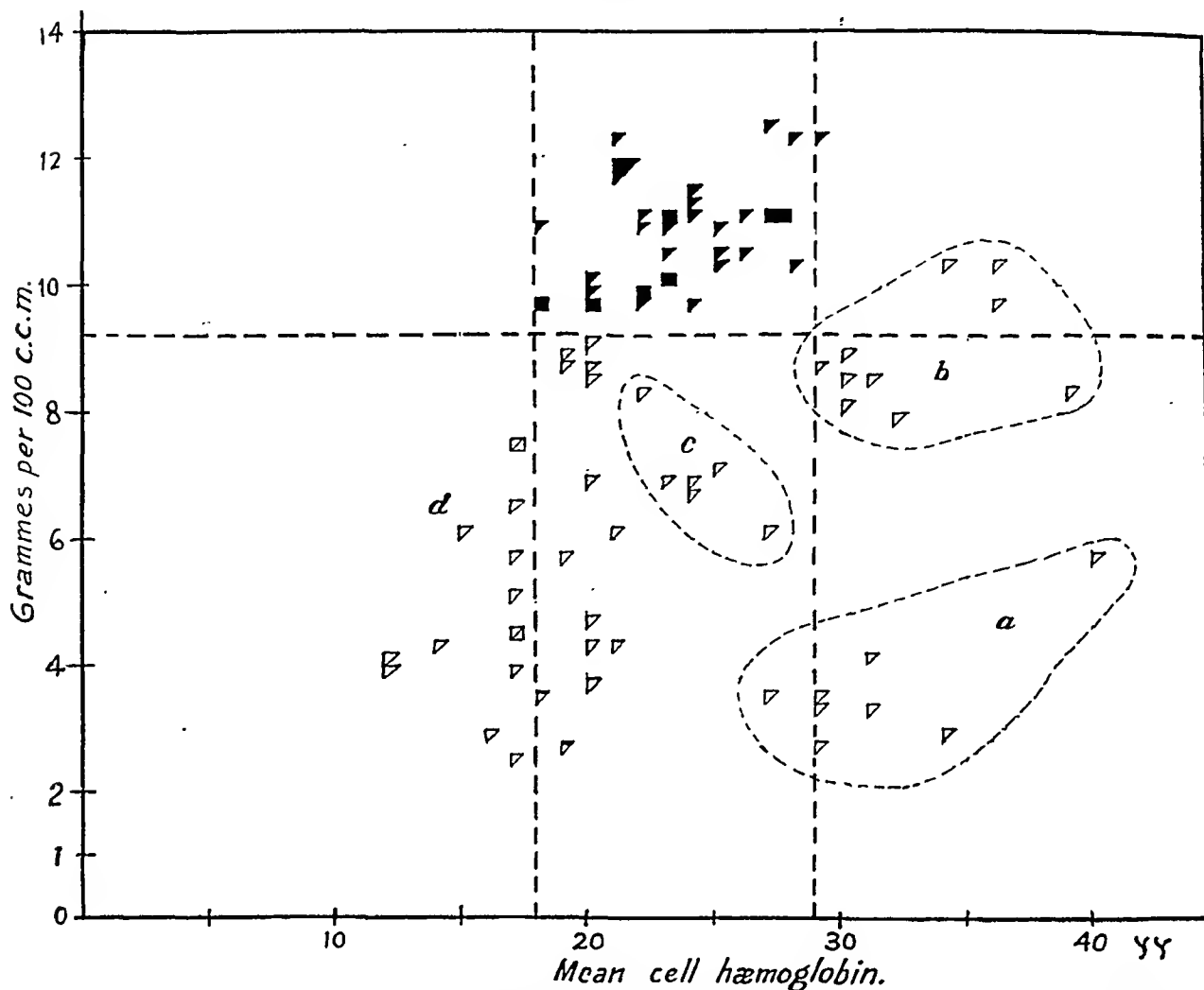
second examination was made after delivery. These results have not been fully analysed yet, but there are certain points about the findings in this group that are of interest. These 52 cases can be divided into four groups:—

- (a) Hyperchromic. Markedly anæmic 8.
- (b) Ditto. Slightly anæmic 10.
- (c) Orthochromic. All moderately anæmic 6.
- (d) Hypochromic. A continuous group, all degrees 28.

If the cases were divided according to the size of the cell, they would fall into corresponding groups, with a few minor exceptions; that is to say, the 18 hyperchromic cases were also macrocytic, and the 28 hypochromic were microcytic.

The chart shows these graphically.

CHART III



Showing distribution of 40 'normal' and 52 anæmic pregnant females according to their hæmoglobin percentages and mean corpuscular hæmoglobin.

The orthochromic (normocytic) cases were probably mixed microcytic and macrocytic cases, but leaving these out of consideration we see that the rest are roughly two-fifths macrocytic and three-fifths microcytic, and, if we compare this analysis with the anæmics in the general population, we see that the macrocytic group is quite a new element that seems to have come in with the pregnancy.

Now in this series we undertook no treatment and only followed up a small number of the cases; of those who were examined a second time, after delivery, all the microcytic ones had maintained their microcytic nature and most of the others showed a tendency towards the microcytic side. That is to say, the macrocytic tendency seemed to disappear with the termination of pregnancy.

It is obvious that we must know more about how these pregnant anæmics react to different forms of treatment, and we are now examining a series and following up each case as long as practicable. I think that my assistant has now done about 40 cases in this series, but I have

only received particulars of about 24, and I have not yet analysed these fully. It is of some interest that of these 24 cases only six are microcytic. This finding of 25 per cent microcytic against 60 per cent in the last pregnant series seems to require some explanation. The cases are from a different district and we may find that this provides the explanation, but I have another suggestion to put forward: this last group of cases is from Dr. Fraser's practice and for a year or so he has used ferrous sulphate very freely. It seems to me possible that he may have eliminated the majority of his microcytic anæmias by the use of iron and that therefore the residue is mainly the macrocytic and normocytic groups.

Going through these cases, I find that the results of treatment have been singularly disappointing and that in the presence of the fœtus little improvement has occurred, whatever the treatment given. In no cases has marmite had any beneficial effect and in very few has liver extract produced any dramatic improvement or a reticulocyte response. After delivery most

cases have improved whatever treatment was given or even in the absence of any specific treatment.

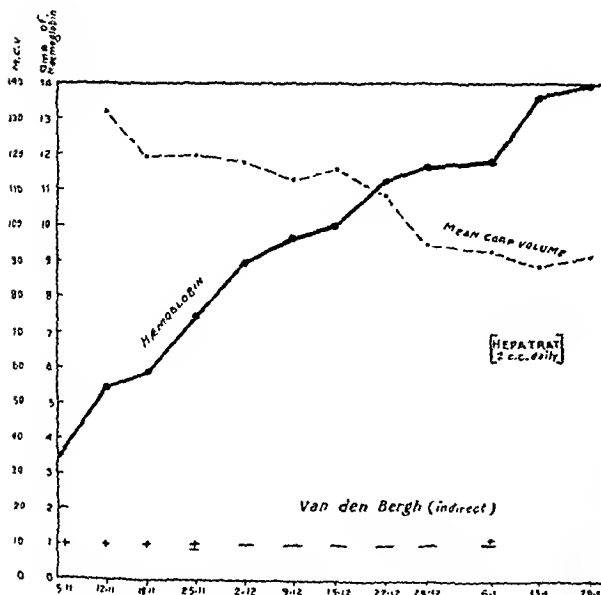
I am not in a position to make any recommendations regarding the treatment of anæmic pregnant coolies. Though I know I am saying something which must be quite obvious to every one, the best hope seems to be in prevention rather than cure. That is to say, one should see that all anæmic females are treated in the early days of their pregnancies when they are mostly suffering from microcytic anæmias that respond well to treatment by iron, because I believe that there is some evidence that these microcytic anæmias become macrocytic in the later months of pregnancy, and then they are extremely resistant to treatment even with that expensive substance, liver extract.

#### Macrocytic anæmia due to general dietary deficiency

There is just one other point that I should like to bring up in connection with anæmia in Assam and elsewhere. There seems to me to be little evidence that even the macrocytic anæmia in Assam is the tropical macrocytic anæmia described by Dr. Lucy Wills. There is little evidence of vitamin-B deficiency in the dietary, and there is still less evidence that vitamin-B substances will effect a cure. In Calcutta, we have found that marmite has a specific effect in certain cases, but we have also found that some patients improve on a rich mixed diet in which there is no excess of vitamin B. At present we are attempting to find out what is the special food factor that produces this change.

I will show you the charts (charts IV and V) of two cases and will remind you of the experi-

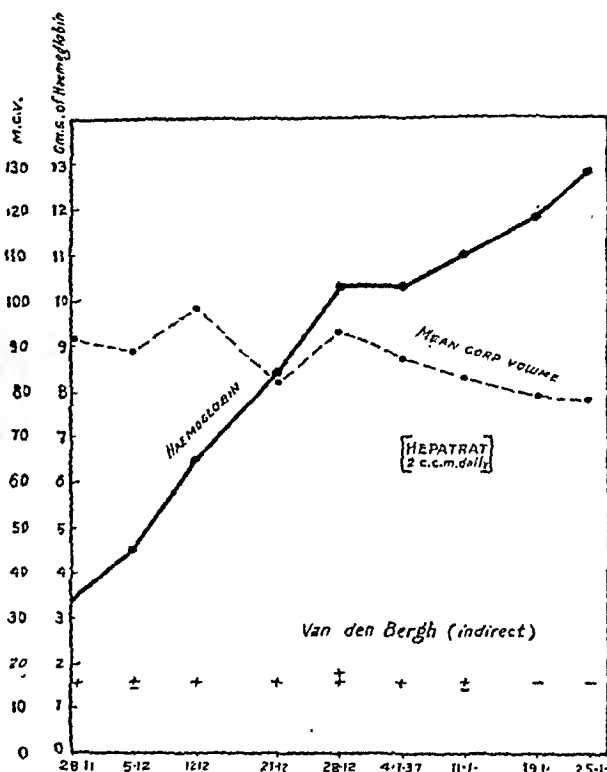
CHART IV



ment that we did up here with eight cases of microcytic anæmia (chart III); the contrast is very striking.

Both these patients were of the coolie class and on investigation were found to be living on a very deficient diet, consisting mainly of rice. In hospital they received the hospital diet, which is a good mixed diet of about 3,000 calories. In one patient the improvement was

CHART V



from 3.5 grammes to well over 10 grammes within a period of a month, and he reached about 12 grammes without any medicine whatsoever. In the second case, the rate of improvement was a little slower and it ceased at about the 10-gramme level; liver extract was then given in both cases and there was another sharp rise. In the second case the cells had been very large and still remained well above normal until the liver extract was given; then the size fell to the usual level.

Both these patients were suffering from some dietary deficiency which hospital diet supplied almost wholly in one case, but in both liver extract caused a further sharp rise which suggests that this substance was able to supply something that ordinary diet did not.

It will be remembered that in the eight microcytic cases there was no improvement at all on

(Continued at foot of next page)

## A SHORT NOTE ON THE USE OF PNEUMONIA STOCK VACCINE IN THE TREATMENT OF THE PNEUMONIAS\*

By G. FRASER

*Labac Central Hospital, Dewan P. O., Cachar*

THE investigation into pneumonia in Assam has been going on for the last two or three years and at our 1935 meeting Dr. Napier disclosed a few interesting facts regarding the types prevalent here up to that time.

Direct typing, mouse inoculation, and cultural methods were used.

Five strains were identified as hæmolytic streptococci and 60 strains as pneumococci. Of the 60 pneumococcal pneumonias 15 were broncho- and 45 lobar pneumonias.

The recognized fixed types I, II and III were poorly represented but a large number was of an apparently virulent type, not identifiable with any sera in their possession; this he provisionally called B; there was another uncommon type not associated at that stage with any mortality which he called A.

It was supposed, then, that commercial stock serum would not be of much use in treatment in these districts.

Last year, at this meeting, I suggested that in view of the expense of serum and the difficulties such as typing, repeated intravenous injection especially in children, thermal reactions and rigors and the limited efficacy even with the commercial polyvalent serum which is, at the same time, more expensive, a trial should be given to the simpler vaccines, and that the Calcutta School of Tropical Medicine might proceed to produce a vaccine from the types

\* Being a paper read at the Annual General Meeting of the British Medical Association, Assam Branch, in January 1937.

*(Continued from previous page)*

a rich diet, but immediate improvement on iron administration (see chart III).

**Acknowledgments.**—I will take this opportunity to acknowledge the invaluable assistance given to me and my assistants by Dr. David Manson of Cinnamara, Dr. George Macdonald of Mariani and Dr. George Fraser of Labac. The data reported are taken from coolies in their practices and without their interest and co-operation it would have been quite impossible to do this work.

Most of the actual blood examinations were carried out by my assistants, Doctors C. R. Das Gupta, H. S. Bilimoria and D. N. Mazumdar, whose names are, or will be, associated with mine in the fuller reports on this work that have appeared in, or will be submitted for publication to, the *Indian Journal of Medical Research*.

encountered by Dr. Napier on the lines of Prof. Wynn's P. S. I. formula. Dr. Napier in due course very kindly prepared such a vaccine.

The vaccine is a plain emulsion made from young primary cultures and sterilized by heat. The vaccine must be active and of known antigenic power; any great degree of subculturing causes loss of smooth, virulent organisms, and therefore loss of active antigenic power. The aim is to obtain an immediate non-specific effect, developing after this a specific effect, and for the latter purpose this vaccine is composed of the particular pneumococcal types encountered, here provisionally called A and B, plus the hæmolytic streptococci also encountered. Prof. Wynn in his formula also has *B. influenzae*, but at present this has not been incorporated in our vaccine.

The principle is that of vaccine generally. In pneumonia particularly the curve of intoxication rises rapidly and then remains at a high level. Specific antibodies are at first absent but begin to appear about the fourth or fifth day; the curve rises slowly at first, then rapidly, reaching a maximum at about the seventh day, when in a favourable case a crisis will occur. The object is to hasten the production of antibodies. Antibodies are specific in pneumonia as in other diseases and these specific antibodies are produced only after a few days. There is an immediate effect however in the stimulation of non-specific antibodies—an immediate outpouring of bactericidal substances. This form of immunity is first exploited, and reinforced in due course by specific immunity and it is for this last purpose that it is desirable that specific-type organisms be used in the production of the vaccine. It is essential that the therapy be commenced early before toxin becomes fixed in dangerous amount in heart and nerve cells, and while leucocyte response is vigorous. At this stage, too, the patient is unsensitized and can react promptly and can control or even abort the disease. In, for instance, unresolved pneumonia or any chronic infection he is sensitized and only gives unpleasant and unfavourable reactions. These are general principles but I borrow them as a reminder from an article by Prof. Wynn.

A suitable dose is 200 million of each of the organisms and proportionately less for children. It can be repeated every 24 hours for three days.

I have been using this vaccine since last May and have brought here some charts and case sheets for your perusal. You will see from these the precipitate fall of temperature in many cases and the rapid rise in leucocyte count. Many of these cases were found to have pneumococci in their sputum. More striking than anything was the clinical appearance in so

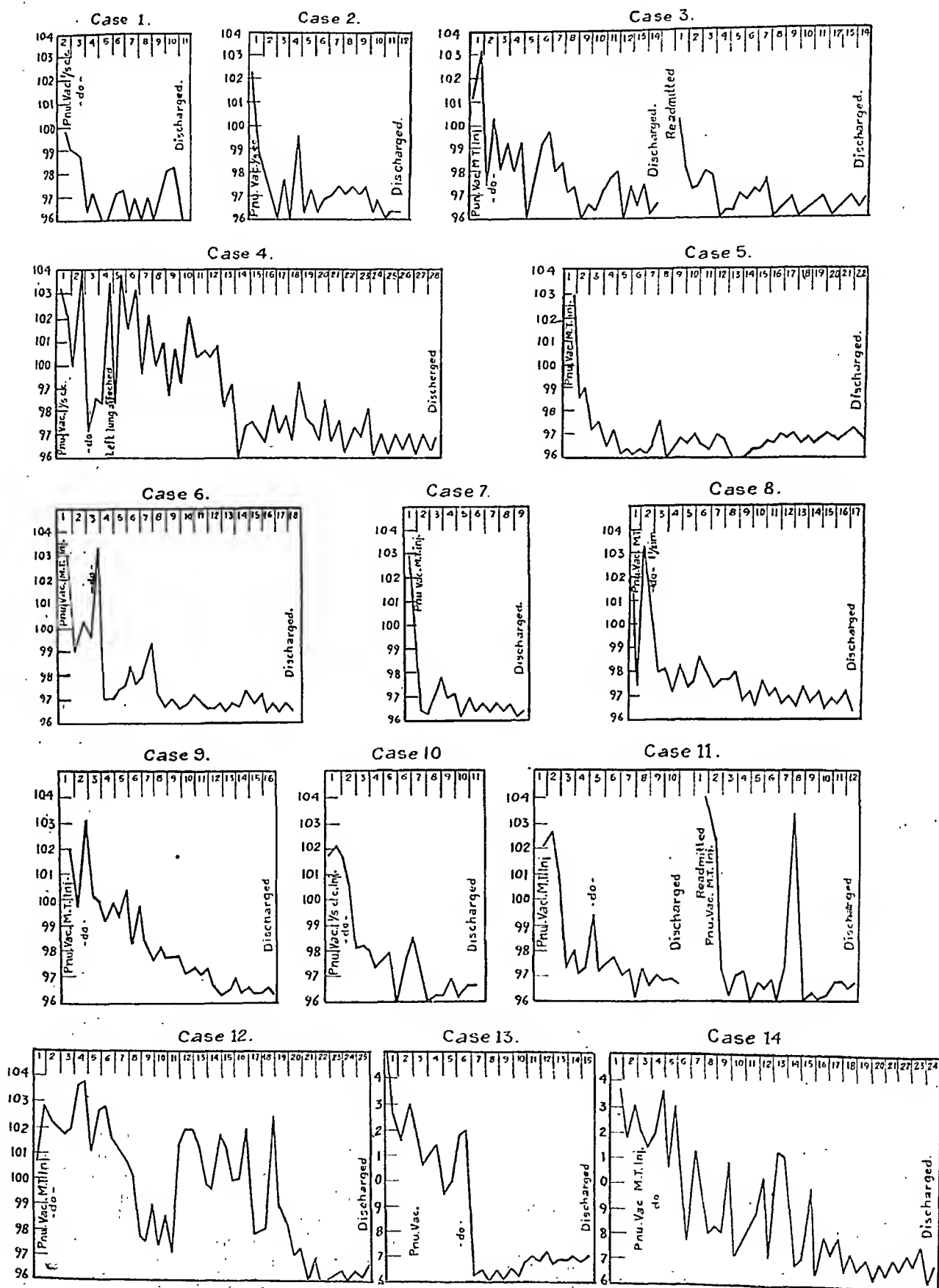
TABLE  
Showing the progress in 22 cases of pneumonia successfully treated with vaccine

No.	Sex and age in years	Nature	Duration in days	Date	Pulse	Respiration	Temperature, °F.	Total W. B. C.	Polymorpho-nuclears, percentage	Vaccine
1	Female, 25	Lobar	1	9th May 10th " 13th May	125 99/100	42 20/22	99.8 99/98.8 97.2/97.4	15,412	74	0.2 c.cm. 0.2 "
2	Male, 22	Lobar	1	13th May 14th " 17th " 23rd "	100/90 70/68 70/72	40/38 30/24 22/22	11,250 11,562 15,937 6,875	5,629 11,250 11,562 6,875	61 51 64 58	0.2 c.cm. 0.2 "
3	Female, 5/12	Broncho	1	21st June 22nd " 30th " 24th July (readmitted). 26th July	170/190 150/150 98 100/90	76/80 50/53 22/20 28/23	101.2/103.2 97.4/100.2 96.4/97.2 100.4/98.6	14,062 19,845 25,937 ..	63 45 58 ..	1 minim. 1 " ..
4	Male, 55	Lobar (double).	2	1st Aug. 19th April 20th " 22nd " 25th "	90/88 .. 110/110 118/122	23/22 .. 28/30 34/40	98.4/98.2 .. 103/102.2 100.2/104	10,000 .. 16,875 13,625	.. .. 83 80	1 minim (for 2 days). .. 0.2 c.cm. 0.2 "
5	Female, 6/12	Broncho	1	1st May 15th May 16th July 19th " 1st Aug. 4th "	120 96/94 .. .. .. 140	30 26/22 .. .. .. 58	99.6/102.2 98.6/99.2 102.4 98.6/99 .. 103	14,018 14,375 .. 13,437 26,875 19,062	.. .. .. .. .. ..	1 minim. 1 " ..
6	Male, 4	Broncho	1	10th July 12th " 15th " 21st "	104/130 .. .. ..	40/45 .. .. ..	96.6/103.2 98.4/97.6 .. ..	10,025 .. 18,750 15,000	.. .. .. 63	1 minim. 1 " ..
7	Female, 4/12	Broncho	1	14th May 15th "	130/110 ..	36/30 ..	103/100 96.6/96.4	10,937	46	1 minim. ..
8	Female, 1½	Broncho	1	13th May 14th " 15th " *26th "	150/144 .. .. ..	53/50 .. .. ..	100.4/97.4 103.4/100.2 98/98.2 ..	11,562 15,000 .. ..	70 55 .. ..	1½ minims. 1½ " ..
9	Male, 6/12	Broncho	1	27th June 28th " 29th " 4th July 11th "	120 98/30 .. .. ..	30 25/35 .. .. ..	102 99.6/103.2 100.2/100 .. ..	10,437 8,750 20,625 8,750	65 68 61 ..	1 minim. 1 " ..
10	Male, 14	Lobar	1	6th July 7th " 9th "	88/99 110/108 ..	32/32 30/30 ..	101.6/102.2 101.6/100.6 98/97.4	9,062 13,750	69 73	0.2 c.cm. 0.2 " ..

\* Sudden attack of malaria (benign tertian).







Temperature charts in cases of pneumonia treated by vaccine.

many cases. It is common one day to see the patient very distressed and anxious with high temperature and rapid pulse and respiration, and next day after vaccine administration his temperature has fallen to normal, pulse and respiration are quiet and within normal limits and he looks placid and feels better, yet on examination he will be found to have a portion of lung consolidated and to be expectorating pneumococci. It is suggested that the vaccine may hasten the consolidation and evolution of the pneumonia phases generally. Even if the temperature does not come down the patient commonly admits to feeling better, his tongue is moist and he looks fairly cheerful and the general impression is that he is going to do well.

Broncho-pneumonias respond in the same satisfactory way in my experience.

I have seen the same thing happen from time to time with S.U.P., and I have no doubt many here have also done so and some may say they have seen sudden defervescence and clearing up of a pneumonia with no particular form of therapy at all. What I feel is that with this vaccine I am using there is a satisfactory clearing up of the disease at an early stage *more frequently* than with any form of treatment I have hitherto used.

My experience of this vaccine is limited to a very short series of cases, too few perhaps to be very convincing—23 with this pneumonia stock vaccine of which one died, an old man of 75, who came seven days late and was already at death's door. The progress in these cases can be best appreciated by reference to the table and temperature charts.

There is a series of cases treated with S.U.P. in which there were three deaths in 26 cases. It would be unfair to compare these, as most of the vaccine series had come in the early stages; for example, 13 one day late only and 6 two days late, whereas the S.U.P. series had 3 one day late, 4 two days late, 5 three days late and 11 four or more than four days late.

I am convinced from my own observations that an improvement in results is obtained with this vaccine. It is, however, very desirable that others also give it a trial so that its value may be properly assessed. If its efficacy is confirmed it will be a simple and cheap remedy.

I have used it only at my central hospital so far, so as to obtain a proper estimate of its value first hand, but I am now releasing it for use at the garden hospitals, which, of course, nurse their own pneumonias.

I am very grateful to Dr. Napier for taking the trouble to make up this vaccine and I am sure if any one is interested he will be pleased to give him some for trial.

## THE OPERATIVE TREATMENT OF VESICO- AND VESICO-URETHRO VAGINAL FISTULÆ BY THE VAGINAL ROUTE WITH CASE NOTES ON THIRTY-THREE CASES

By S. N. HAYES, F.R.C.S., F.C.O.G.  
MAJOR, I.M.S.

*Professor of Obstetrics and Gynæcology, King Edward Medical College, Lahore, and Medical Superintendent, Lady Willingdon Hospital, Lahore*

THERE is no more distressing complication of labour than a vesico-vaginal fistula—converting, as it does, a normal healthy girl into a wretched creature whose life is a perpetual misery, and who is willing to undergo any operation to be free from the constant dribbling of urine, or who, as so many patients have said, would rather die than continue in her present condition.

Although small fistulæ can easily be cured, the larger ones presumably present certain difficulties, as evidenced by the number of cases one sees on which several operations have been performed, each one causing increased fibrosis, until ultimately there is no alternative possible except transplantation of the ureters.

Since 1931, sixty-three cases of vesico- and vesico-urethro vaginal fistulæ have been operated on at the above hospital—thirty-three by the vaginal route, of which twenty-eight were cured, two partially cured, two failed, and one died of blackwater fever.

It is noteworthy that the failures occurred in the early cases and were undoubtedly partly due to lack of experience.

This paper describes the technique that has been gradually evolved at this hospital and found satisfactory. As experience accumulates, larger and larger fistulæ are being attempted and cured, and it is hoped that in the near future it will be possible to describe a technique that will result in a very high percentage of cures without having to resort to transplantation of the ureters.

### *Ætiology*

The causes in this series are thirty cases following labour, one case due to trauma—a wooden stick, which was being inserted into the uterus to procure an abortion, was pushed through the vaginal wall into the bladder (case 10).

The majority of cases give a clear history of prolonged labour and early rupture of the membranes. It is most probable that the commonest cause of obstruction was an unreduced occipito-posterior position, with the following results—the bladder becomes distended, the urethra elongated, the sinciput presses the base of the bladder and upper part of the urethra against the symphysis pubis, pressure necrosis ensues, and after exfoliation of the necrosed area the fistula results.

### Classification

Fistulæ vary so considerably that any accurate attempt at classification is impossible.

From the operative point of view, they fall naturally into two classes :—

- (1) Simple.
- (2) Complicated.

(1) Simple fistulæ vary in size from a pin-hole to about half an inch in diameter. (Beyond this size the urethra is usually involved or fibrosis is excessive.) They are generally centrally situated and involve the anterior wall of the bladder. Fibrosis is absent or slight, and the cervix and uterus are mobile. The urethra is not involved.

(2) Complicated fistulæ are usually larger than half an inch in diameter. Fibrosis and cicatrization are present to a varying degree, from slight to a one-finger contraction of the vault and lumen of the vagina. The bladder is frequently bound down to the posterior surface of the symphysis pubis, and laterally to the rami of the pubes. The urethra is usually involved—from destruction of a small portion of its upper end, to complete destruction. Out of sixty-three fistulæ, the urethra was involved in thirty-two. The bladder mucous membrane may be prolapsed into the vagina. The base of the bladder is involved causing destruction of the sphincter.

The cervix is often not visible, either through destruction or by a transverse barrier of fibrous tissue of cartilaginous hardness in the upper part of the vagina. The uterus is usually fixed.

### Choice of operation

I, personally, consider that the vaginal route is the operation of choice. Surprisingly large fistulæ can be cured by this route, and the patient is returned to her normal condition. As no operations have been performed by the supra-pubic route, no opinion can be expressed on this method. The method is attractive in theory, and could be combined with a vaginal operation. In future, it is intended to use it for cases in which the vaginal method has failed. Although thirty cases of transplantations have been done, I consider that it is an operation that ought only to be done when all other methods have failed. Reasons will be elaborated in a future paper on transplantation operations. A combination of either supra-pubic and/or vaginal operation would probably have sufficed in quite a number of the thirty cases of transplantation operations.

A method of treating small inaccessible simple fistulæ by diathermy has recently been described. This method can only be applicable to very small fistulæ, and we also know by experience that a very large percentage of small fistulæ will heal spontaneously or to the treatment of an indwelling catheter.

### Signs and symptoms

Dribbling of urine is the chief symptom. When a recto-vaginal fistula is present, the complaint is the passage of urine and faeces per vaginam.

The vulva is usually excoriated, and this may spread down the inner side of the thighs and legs to a varying degree.

As a well-marked cystitis is present, fever is frequently complained of.

### Treatment of recto-vaginal fistulæ

Out of sixty-three cases, recto-vaginal fistula was present in six.

It is important that these fistulæ should be closed before any attempt is made on the vesico-vaginal fistula.

They usually present no difficulty. Schuchardt's incision (described later) or a median episiotomy is often necessary in order to ensure adequate access. The rectum is then freely mobilized and the fistula closed with double 00 catgut Lembert's sutures. The vaginal mucous membrane is closed with a continuous no. 1 catgut suture.

### Pre-operative treatment for vesico-vaginal fistulæ

The object in view is to clear up any cystitis present, and to provide an operation area as clean as possible.

(1) Bladder washouts of boric acid are given once or twice daily.

(2) Sitz baths twice daily.

(3) An ointment of zinc oxide and lanoline is applied to the labia.

When the bladder and wound are clean, an ounce of castor oil is given 48 hours before operation.

A bowel wash is given the night before and morning of operation.

No vaginal douches are given as these make the vagina 'soggy' and friable, and increase the amount of hæmorrhage during operation.

### Operation—Instruments used

The ordinary standard set of gynæcological instruments is used with the addition of the following :—

(1) *Scissors*.—Irwin Moore's cleft-palate, seven inches long, curved on flat, one pair fully curved, one pair slightly curved. The cutting blades are one-and-a-quarter inches in length. I have had the points slightly modified to correspond to a very blunt pair of Mayo's scissors.

(2) *Dissecting forceps*.—One pair of long tonsil forceps with rat teeth. One pair of long tonsil forceps with the teeth ground away.

(3) Luc's angular nasal forceps for the assistant to use when swabbing.

(4) *Needle holder*.—Bozeman's.

(5) *Needles*.—Mayo's nos. 12 and 18.

(6) *Sutures and ligatures*.—20-day catgut, nos. 0000, 00 and 1.

### Operation

The patient is shaved in the ward, and prepared on the table by thorough cleaning of the vagina, vulva and buttocks, with cotton-wool dipped in ether soap, followed by douching with sterile water, drying and painting with methylated spirits.

#### Access to fistula

It is of great importance that adequate access be provided. The use of Schuchardt's incision is of the greatest value, and, if properly carried out, converts the vagina into a wide funnel with the apex at the top. The incision can be made on the right, left or both sides. I have never had occasion to make more than a single incision and usually on the left side.

#### Schuchardt's incision and author's modification

In several cases, owing to excessive cicatrization of the vagina, it has been necessary to 'borrow' tissue from the skin of the buttocks. In order to do this, I have modified the original Schuchardt's incision. Figure 1 shows the Schuchardt's incision indicated by a thick black line, the modification by dotted lines. This incision should be made as follows:—

(1) The posterior commissure is placed under tension by picking up the left labium at the point marked 'A' in figure 1 with a pair of tissue forceps, and retracting outwards and forwards. The operator places the left index finger in the vagina and tenses the fourchette forwards and, at the same time, presses the rectum backwards and to the right with the tip of the finger. The incision in the fourchette and perineum is made by cutting outwards and backwards. The anterior end of the incision extends about half an inch inside the vagina, the posterior end midway between the anus and tuber ischium.

The incision is deepened until the levator ani is seen.

The vaginal incision is then extended upwards along the junction of the left posterior lateral wall of the vagina as high as is desired, and only including the vaginal mucous membrane.

Three important points must be noted—

(a) to keep tension on the vaginal walls when cutting;

(b) to press the rectum backwards and to the right with the left index finger; and

(c) to cut outwards and backwards.

The anterior fibres of the levator ani may be incised if additional space is required.

In cases of great contraction of the vagina requiring a plastic operation, I have modified the original incision as follows:—

After cutting through the posterior commissure and proceeding downwards for about half to three-quarter of an inch (to 'X', figure 1) the incision is curved outwards and to the left for one-and-a-half inches (figure 1, 'B', dotted line). The incision is then proceeded with as described above.

After closure of the fistula, an estimated amount of new tissue required to form an adequate vaginal lumen is made, and a flap of suitable size made by extending the original incision from 'X' (the flap is shown in dotted lines, figure 1). By freely undercutting, a mobile flap can be formed and swung into the vagina, the apex of which can be approximated to as high as the cervix.

The results of this manoeuvre have been most gratifying.

#### Fundamental principles required for successful operation

(1) Free exposure is essential. This is obtained by Schuchardt's incision.

(2) The bladder must be thoroughly mobilized. By thorough mobilization, I mean that when the bladder has been separated from the

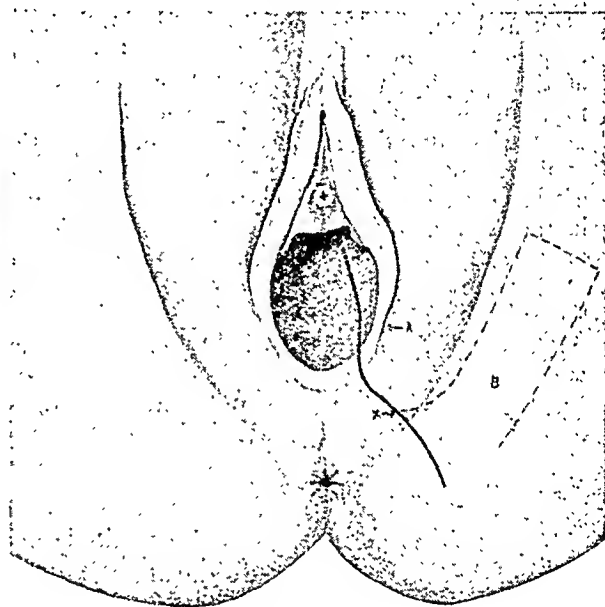


Fig. 1.

vagina, it can easily be pulled into the vagina and approximation of its walls during suture be made *without tension*.

(3) The same remarks apply to cases in which the urethra is involved. The anterior and lateral walls must be freed from the vaginal wall, until the urethra can be approximated to the bladder *without any tension whatsoever*.

(4) Accurate suturing.

In addition, infiltration of the entire area with adrenaline solution or adrenaline and novocaine will considerably reduce the amount of hæmorrhage.

#### Method of closing simple fistulæ

The edges of a fistula should never be excised. (Excision is recommended in most textbooks.) As a result of excision, the bladder mucous membrane retracts and post-operative hæmorrhage results, very often of a serious nature and always troublesome to control.

The first step is the separation of the bladder from the vaginal wall, followed by mobilization of the bladder. An incision is made with a pointed scalpel, one-sixteenth inch from the edge of the fistula, through the vaginal wall and down to the bladder. Upper and lower incisions of suitable length are made at the same time (figure 2, 'BB'). The remainder of the mobilization of the bladder is carried out by means

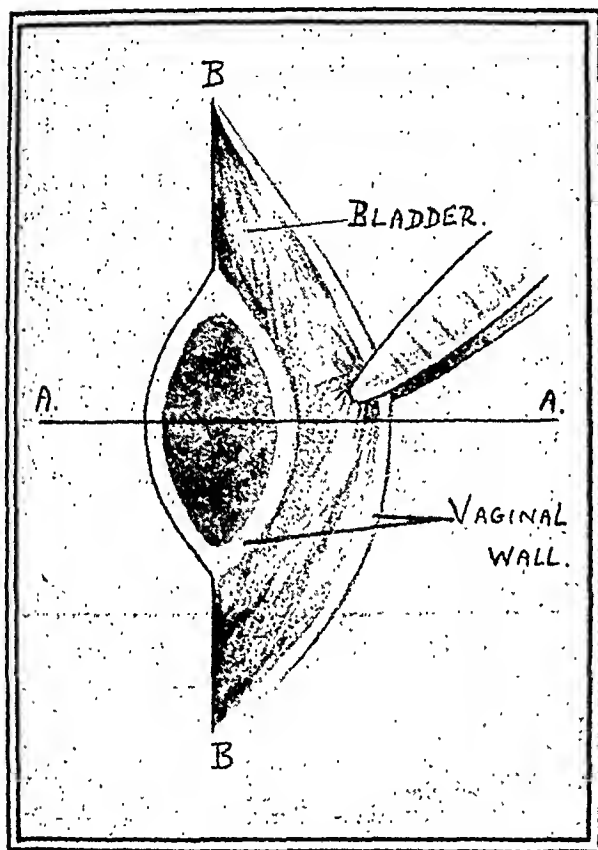


Fig. 2.

of the Irwin Moore's curved scissors and tonsil forceps. The edge of the fistula is held by the forceps and the bladder wall identified by means of cutting and blunt dissection with the scissors. Once this identification is made, the vaginal wall is easily stripped from the bladder by means of the scissors, and free mobility of the bladder is obtained.

#### *Suture and closure of the fistula*

Two continuous sutures are inserted of 0000 20-day catgut on a small Mayo's needle (no. 12 or 18).

The first suture is considered the most important.

At the edge of the fistula and in the bladder muscle, a certain amount of fibrous tissue is present, i.e., there is a ring of fibrous tissue just external to the fistula. This fibrous tissue is formed as a result of inflammation and repair. By inserting the needle deep into the bladder on the left side, and working the point of the needle mesially towards the fistula, one can appreciate that the needle penetrates and picks up a tissue that is strong and tough and in marked contrast to the bladder muscle. The point of the needle is made to emerge slightly external to the cut edge of the vagina. The reverse process is carried out on the left side. Tightening of this suture inverts the edges of the fistula.

A diagram of a section of figure 2 at 'AA' illustrates these points.

I consider the picking up of this strong fibrous tissue a most important point in technique and aid to success.

This continuous suture closes the fistula.

The second suture is a continuous Lembert's with 0000 or 00 20-day catgut, which passes through the bladder muscle and covers over the first suture.

The vagina is closed with a continuous no. 1 20-day catgut suture.

#### *Method of closing complicated fistulae*

These fistulae vary enormously in size, in the amount of tissue destroyed and in the degree of cicatrization of the vagina. The chief difficulties are:—

(1) to provide sufficient mobility to enable suture to be performed;

(2) to provide sphincteric control; and

(3) to attach the remaining portion of the urethra to the bladder.

Two outstanding features in the operations performed have been—

(1) the inability to recognize anything that may have been regarded as a sphincter of the bladder, and

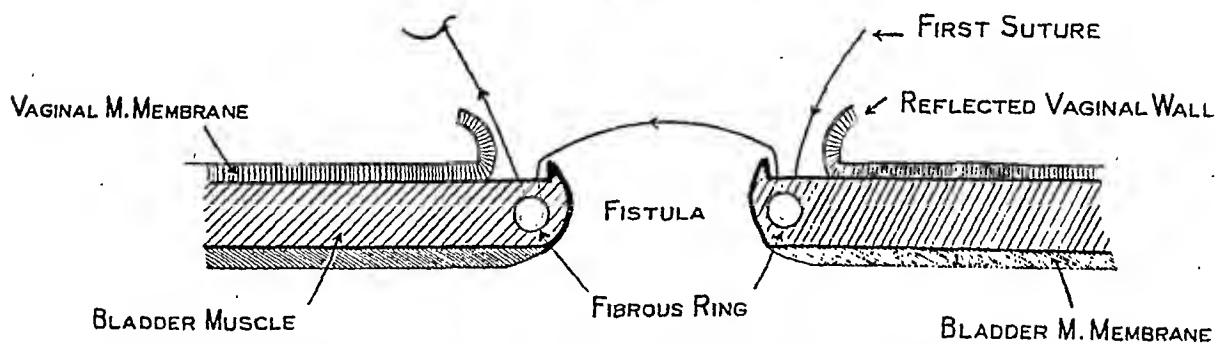


Fig. 3.—Sectional diagram at 'AA', figure 2, to show method of inserting the first stitch.



(2) the extraordinary manner in which sphincteric control has been obtained, when a fistula has been closed and attached to the remains of the urethra. It would appear that, providing the aperture is closed to a sufficient degree, sphincteric control rapidly becomes established. I can give no explanation of this peculiar fact.

#### *Provision of mobilization*

The preliminary steps are as for simple fistulæ. It will be found, however, that free mobilization is not so simple, as the bladder adjacent to the fistula is frequently adherent to the posterior surface of the symphysis pubis and to the rami of the pubes by fibrous tissue—often in the form of bands. These can be palpated by the finger and divided by scissors. By palpation and scissors cutting, all fibrous adhesions are freed until the bladder is completely free.

#### *Treatment of urethra*

The urethra is mobilized by making a vertical incision over the upper three-quarters of its length and reflecting the vaginal wall anteriorly and laterally. It is invariably contracted, and, after it is freed, an extra one-third of its length can be obtained without any increased tension.

The tissue lying between the posterior wall of the urethra and the fistula should, when necessary, be widely undercut and freed. It can then be used as a new upper part of the urethra, or the undercutting allows of easy approximation of urethra to bladder.

#### *Suture of bladder*

If possible, two vertical 0000 catgut sutures are used. In very large fistulæ it is sometimes necessary to suture transversely.

The first suture is inserted from above, downwards, and when the fistula is nearly closed, a no. 8 self-retaining rubber catheter is inserted through the urethra into the bladder. The first suture is then completed and the bladder is comfortably tightened over the rubber catheter at the site of the new internal os.

The urethra is then attached to the bladder by a transverse 0000 continuous catgut suture, followed by a second 0000 suture.

If there is excessive stenosis of the vagina, a flap is designed, turned in from the buttock and sutured in place.

#### *Post-operative treatment*

(1) In every case a self-retaining catheter is left in the bladder—usually for ten days—but longer, if considered necessary. The catheter is connected to a drainage bottle.

(2) Bladder washouts twice daily.

(3) From the third day, a catheter vaginal douche is given daily. After douching, the vagina is dried with cotton-wool on a probe.

If the discharge is unhealthy, hydrogen peroxide is used before the douche.

(4) Diet—fluids until fifth day.

(5) Bowels opened on the fourth day, with liquid paraffin and olive-oil enemata daily and mild aperients.

(6) From the tenth day (average) the bladder catheter is removed for an interval which is increased daily. Usually by the fifteenth day it is entirely omitted.

#### *Summary*

(1) A description is given of the operative treatment adopted in thirty-three cases of vesico- and vesico-urethro-vaginal fistulæ by the vaginal route.

(2) A modification of Schuchardt's incision is described for use when plastic operations on the vagina are necessary.

(3) A method is described of inserting the first stitch, when closing the bladder fistula.

Cases 4, 13, 18 and 25 were operated on by my assistant, Dr. J. E. R. Heppollette, by the technique described, and I have to thank him for allowing me to include them in this series.

I have to thank Sister Bamford and the nursing staff of the Lady Willingdon Hospital for the great interest they have taken in the post-operative treatment.

#### *Abstract of vaginal operations*

Case	Type of fistula	Result	REMARKS
1	Vesico- and urethro-vaginal.	Cured	Notes incomplete.
2	Vesico-vaginal	Failed	
3	Vesico-vaginal	Cured	
4	Vesico- and urethro-vaginal.	Cured	
5	Vesico-vaginal	Failed	Notes incomplete.
6	Vesico- and urethro-vaginal.	Cured	
7	Vesico-vaginal	Cured	Also right and left salpingo-oophorectomy for tubo-ovarian abscesses.
8	Vesico- and recto-vaginal.	Cured	
9	Vesico- and urethro-vaginal.	Cured	
10	Vesico-vaginal	Cured	
11	Vesico-urethro- and recto-vaginal.	Cured	Subsequently became pregnant. Cæsarean section on 25th October, 1935. Vagina normal. No evidence of previous operation or cicatrization.
12	Vesico-vaginal	Cured	
13	Vesico- and urethro-vaginal.	Cured	
14	Vesico-vaginal	Cured	
15	Vesico- and urethro-vaginal.	Cured	
16	Vesico- and urethro-vaginal.	Cured	

Abstract of vaginal operations—concl.			
Case	Type of fistula	Result	REMARKS
17	Vesico- and urethro-vaginal.	Cured	
18	Vesico-vaginal	Cured	
19	Vesico-vaginal	Cured	
20	Vesico-vaginal	Cured	
21	Vesico- and urethro-vaginal.	Cured	
22	Vesico- and urethro-vaginal.	Partial cure.	Plastic on vagina.
23	Vesico-vaginal	Cured	
24	Vesico-vaginal	Cured	Plastic on vagina. Two fistulæ present.
25	Vesico-vaginal	Cured	
26	Vesico-vaginal	Cured	
27	Vesico- and urethro-vaginal.	Cured	
28	Vesico-, urethro- and recto-vaginal.	Cured	Also plastic for new urethra.
29	Urethro-vaginal	Cured	
30	Vesico- and urethro-vaginal.	Cured	
31	Vesico-vaginal	Cured	
32	Vesico- and urethro-vaginal.	Cured	
33	Vesico- and urethro-vaginal.	Partial cure.	Died of blackwater fever. Pin-hole fistula remaining.

# Case and operation details

- Case 1.—Hussaina, aged 28, admitted on 6th October, 1930. Dead child born nine months ago, since then had dribbling of urine per vaginam.
- Operation.—Fistula admitting two fingers easily, involved upper part of urethra and base of bladder. Free mobilization of bladder and urethra difficult owing to adhesions between bladder and urethra. Difficult face of symphysis. Bladder closed with posterior surface of 0000 vertical Lembert's catgut suture. Urethra sewn to bladder transversely. Difficult mobilization as bladder was firmly adherent to posterior surface of symphysis. Vaginal flaps closed with 00 catgut. Result, cured.
- Case 2.—Aisha Bibi, admitted 6th June, 1931. Notes incomplete. Repaired vaginally. Result, cured.
- Case 3.—Ahmadi, admitted on 21st February, 1931. Notes incomplete. Repaired vaginally. Result, cured.
- Case 4.—Has had dribbling of urine per vaginam since birth of last child three months ago. Two previous children born without complications. Notes incomplete. Operation vaginally for urethro-vaginal fistula. Result, cured.
- Case 5.—Admitted on 9th February, 1931. Notes incomplete. Repaired vaginally. Result, not cured.
- Case 6.—Two para. Two months ago delivered of a child, since then dribbling of urine. Vesico-vaginal fistula (V-V F) admitting two fingers tightly. Upper one-third of urethra destroyed. Bladder freed by scissors dissection, mucous membrane over urethra incised vertically and urethra freely exposed. Bladder sewn transversely and urethra freed. Flap of urethra joined to bladder. Lateral flaps freed. Flap turned down from cervix. Vaginal flaps made by incising across. Left hospital with quarter-inch fistula remaining. To return later. Re-admitted 21st April. A fistula of urethra (urethro-vaginal fistula). Urethra exposed by vertical incision. Bladder mobilized. Closed by 00 catgut. Result, cured. Left hospital with full control and no leakage.
- Case 7.—Admitted on 29th August, 1931. Three normal pregnancies. Last, one year ago. Dribbling of urine per vaginam for one year. Fistula in anterior fornix. Large amount of scar tissue. Notes incomplete. Operation vaginally. Result, cured.
- Case 8.—Aged 20. One child one year ago, since birth of which she has been suffering from incontinence of urine and faeces. Has also right and left tubo-ovarian abscesses. The vagina is contracted by a transverse fibrous ridge on the posterior wall. The first finger can be passed through with difficulty and passes into a large recto-vaginal fistula.
- 27th January, 1932. Right and left tubo-ovarian abscesses removed and pelvis drained. Also recto-vaginal fistula closed. Schuehard's incision cutting through the transverse fibrous ridge. Fistula admitted two fingers. Closed with two Lembert's 0000 suture. 10th February. Vesico-vaginal fistula. Admitted little finger. Upper part of urethra completely destroyed. Bladder mobilized. Rubber catheter inserted. Bladder closed with Lembert's suture. Upper part of urethra exposed, stitched to bladder transversely with interrupted sutures. On discharge there is a small opening in the urethra admitting a very fine probe, which will probably close. Bladder control good, and only very slight dribbling from fistula. To return for second operation in one month if fistula does not close and there is any inconvenience. Patient did not return. Assumed cured.
- Case 9.—Admitted on 22nd November, 1932. Complains of passing urine continuously for eight months, since birth of a dead baby removed by instruments. Had two previous normal labours.
- Operation.—29th November. Fistula 1 em. wide. Only the lower one-third of urethra remaining. Fistula involves base of bladder and high up vaginal wall on left side. Bound down firmly to posterior surface of symphysis. Free dissection made—bladder sutured to urethra. Prognosis doubtful. Convalescence uneventful. 14th December. Wound healed perfectly. No leakage except on coughing, bending and walking. To return in two months for further operation.
- Re-admitted on 13th February, 1933. Wound has healed quite satisfactorily. No sphincter control. Cervix is fixed on left side and cannot be pulled down. Urethra although only one inch long is functioning. There is a small cystocele present.
- Operation.—21st February. Wide separation of bladder away from scar and double plication near junction of urethra and bladder. Catheter for ten days. Result.—11th March. Has now complete control of bladder.
- Case 10.—Aged 40. Admitted on 14th December, 1933. Complains of frequency and severe pain during micturition. Symptoms started one year ago, when she went into the jungle to pass urine. States she fell down on to a cotton plant and injured her perineum.
- Examination.—Patient is extremely weak and emaciated. Temperature 99°F., pulse 100. The vagina is filled by a calculus which cannot be removed.
- Operation.—19th December. The vagina contains a phosphatic stone of the size of a hen's egg. There is a narrow pedicle anteriorly which passes through the vaginal wall into the bladder. On sounding the bladder a stone is felt. Suprapubic opening made into bladder. The bladder wall is three-fourths inch thick due to chronic inflammation. A phosphatic stone removed, the size of a pear. Two ounces of pus evacuated. Bladder washed and drained. The vaginal stone was then easily removed. It was found that the pedicle was a piece of stick encrusted with phosphates. The stick was three inches long and one-fourth inch thick. Is called in the vernacular 'an abortion stick'. An attempt had evidently been made to produce abortion but the stick instead of passing into the uterus, had been pushed into the bladder. A V-V F had formed and phosphatic stones formed around the free ends in the bladder and vagina. Convalescence uneventful but V-V F remained. Fistula admitted a thick probe. Closed on 23rd January, 1934, by usual technique. Discharged on 15th February. Has greatly improved in health and weight. No complaints. Result, cured.

**Case 11.**—Aged 30 years. After birth of a dead child two years ago she had fever for four months. She then found that faeces and urine were passed per vaginam.

**Examination.**—Vagina is cicatrized and admits one-and-a-half fingers. There is a recto-vaginal fistula just above the sphincter ani which admits two-and-a-half fingers. A vesico-vaginal fistula high up admits the little finger easily.

**Operation.**—22nd March, 1933. Left Schuchardt's incision. Recto-vaginal fistula closed. Convalescence uneventful. To return in six months for operation on V-V F.

Re-admitted on 2nd April, 1934. A remarkable improvement is present. The vaginal tissues are soft and pliable and there is no evidence of fibrous tissue or old operation scars, except a very fine line at site of Schuchardt's incision.

**Operation.**—11th April. Right Schuchardt's incision. The V-V F admitting easily the little finger is high up and involves the urethral wall, the left lateral part being completely destroyed. Urethra freely exposed and a new left lateral wall fashioned from the vagina. Closed with two vertical Lembert's suture 0000 catgut. Good exposure was difficult and prognosis doubtful as a perfect loose fit was not possible. Catheter left in for 16 days. Result, control perfect.

**N.B.**—The difference between prognosis and result.

**Case 12.**—Aged 16. Admitted on 15th March, 1934. Complained of constant dribbling of urine for one year since the birth of a child.

**Examination.**—A fistula at the junction of bladder and urethra admits the little finger. Slight cystocele also present.

**Operation.**—20th March. Urethra and bladder freely exposed. Fistula sewn transversely with Lembert's suture 0000 catgut, and then vertically with 0000 Lembert's suture. (Bladder was plicated.) Anterior colporrhaphy. Result, cured. Discharged 21 days after operation.

**Case 13.**—Aged 35. Live baby born after long labour four months ago.

**Operation.**—9th July, 1934. Fistula involving the upper end of the urethra and the base of the bladder admits little finger. Mobilization difficult. Re-operated on 23rd July, and a small remaining fistula closed. Result, cured.

**Case 14.**—Aged 27. Dribbling of urine for four months since birth of child. Vagina extensively cicatrized and admits one finger fairly easily.

**Operation.**—5th October, 1934. Fistula at base of bladder admitted little finger. Left Schuchardt's incision. Free mobilization; sutured with 0000 Lembert's. Vagina closed with no. 1 catgut. Self-retaining catheter 12 days. Result, perfect control.

Returned 25th October, 1935. Nine months' pregnant. Caesarean section performed. Live male child. The vagina was normal, admitted two fingers easily and there was no evidence of previous cicatrization and operation.

**Case 15.**—Aged 25. Complained of incontinence of urine for two years. Fistula one-third of an inch in diameter at junction of bladder and urethra. Free mobilization and closure by two 0000 transverse Lembert's suture. Result, cured.

**Case 16.**—Aged 35. Admitted on 25th May, 1935. Complained of passage of urine per vaginam. Four months ago was operated on for stone in the bladder and afterwards developed incontinence. Fistula admits two fingers and involves the upper one-third of the urethra and base of bladder. No cicatrization of the vagina.

**Operation.**—12th June. Free exposure of bladder and urethra which was one-and-a-half inches long. Sutured with double Lembert's 0000 and 00. Bladder plicated. Vagina closed with mattress and continuous sutures. Result, perfect control.

**Case 17.**—Aged 25. Incontinence of urine after dead child born two years ago.

**Operation.**—30th October, 1934. Fistula admits little finger and is situated at junction of bladder and urethra. Free exposure of upper part of urethra and

bladder. Sutured with two 0000 vertical Lembert's suture. Result, cured.

**Case 18.**—Three para. Aged 23. Complained of dribbling of urine through vagina following birth of a dead female child four months ago. Is emaciated and weak.

**Operation.**—1st July, 1935. Fistula admits little finger and is close to cervix. Closed with double Lembert's. Leaked about seventh day. Discharged with pin-head opening which would heal spontaneously. Advised to report if not healed in three months.

**Case 19.**—Aged 18. Two para. After four days' labour gave birth to a dead child one year ago. Since then urine has been dribbling from the vagina. Pelvic measurements— $8\frac{1}{2}$ ,  $10\frac{1}{2}$  and  $7\frac{1}{2}$  inches. Was probably an occipito-posterior.

**Operation.**—20th December, 1935. V-V F size of thumb nail at vesico-cervical angle and on left lateral side. Good mobilization of the bladder obtained. Fistula very adherent to cervix. Closed by double 00 catgut Lembert's suture. Vagina closed with no. 1 catgut. Result, cured.

**Case 20.**—Two para. One year ago gave birth to a stillborn child, since then has had incontinence.

**Operation.**—20th December, 1935. A V-V F admitting one finger easily at the base of bladder. Adherent to cervix and on left lateral side. Free mobilization, and sutured with double 00 Lembert's suture. Anterior colporrhaphy. Result, cured.

**Case 21.**—Aged 18. One para. Complained of incontinence of urine for seven months since birth of a dead child. Was five days in labour and membranes ruptured three days before birth.

**Operation.**—15th April, 1936. Urethra one-and-a-half inches long and displaced to left. Upper end absent. A V-V F and U-V F admitting one finger are present. Cervix not seen, but a fine probe passes posteriorly to the cervix into what was formerly the vault of the vagina but is now a dense mass of fibrous tissue. Left Schuchardt's incision. Mobilization of bladder difficult owing to fibrosis. Urethra mobilized and sutured to bladder by two transverse 00 Lembert's suture. Insufficient vaginal wall remaining to form effective covering. Prognosis bad.

**Result.**—Leakage on sixth day after operation, which gradually diminished. Fourteen days after small fistula present admitting thick probe. Was continent at night and during the day except when frightened or when coughing.

**Commentary.**—Has partial control. Requires further operation in six months' time if not spontaneously cured.

**Case 22.**—Aged 22. One para. Dribbling of urine after birth of dead child two months ago. Labour lasted three days. General condition good. Is strong and healthy. Pelvic measurements—I S 9 inches, I C 10 inches, E C 7 inches, T at O  $2\frac{1}{2}$  inches.

**Operation.**—5th May, 1936. Uterus R V and mobile. Fistula quarter inch in diameter at junction of bladder and urethra which was displaced and bound down to the left side. Distal to the fistula was a constriction due to cicatrization of posterior vaginal wall, and producing an hour-glass contraction of vagina. Cervix not seen and is evidently above constriction, through which a finger will not pass. Modified left Schuchardt's incision, dividing constriction and exposing cervix. Bladder mobilized and upper part of urethra exposed. All adhesions binding fistula to the left divided by scissors cutting. Fistula and urethra closed by vertical double 00 Lembert's suture. A long flap was made by extending Schuchardt's incision outwards and extensively undercutting. The distal end was then sutured to the area on posterior wall of vagina which was deficient due to the constriction being divided.

**Result.**—Complete control. Vagina admits one-and-a-half fingers to vault. Cervix easily seen. To return in three months for plastic operation on vulva.

**Case 23.**—Aged 24. Two para. Complained of dribbling of urine for one year immediately following breach presentation. Had been in labour 40 hours, after

which a *dai* extracted the *fœtus*. Measurements—*I S* 8½ inches, *I C* 9½ inches, *E C* 6 inches, *T* at *O* 2 inches.

*Operation*.—29th May, 1936. Uterus *R V* and to right. Bladder mucous membrane prolapsed into vagina. Fistula admits two fingers loosely and involves upper part of urethra and base of bladder. Adherent to cervix. Left Schuchardt's incision. Bladder and urethra freely mobilized. Bladder sutured vertically with 0000 catgut as far as urethra. Urethra joined to bladder by transverse 0000 Lembert's suture. Bladder and urethra reinforced by one vertical 0000 Lembert's suture. A fibrous constriction on posterior wall one inch from cervix was divided and the tissue replaced by swinging the mesial flap upwards.

Although the fistula appeared to be inoperable, mobilization was fairly easy and suture without tension was obtained. Doubtful prognosis and almost certain to have no control.

*Result*.—Fifteen days after operation, wound healed except one small granulating area. Catheter kept in for 19 days, after which slight dribbling, then complete control.

*Case 24*.—Aged 35. Seven para. Complaints of dribbling from vagina. Duration six months. Gave birth to a stillborn child by instrumental delivery after 39 hours' labour. Measurements—*S*½, 9, 6 and 2½ inches.

*Operation*.—29th September, 1936. Left Schuchardt's incision. The cervix was fissured due to old lacerations. Is mobile in spite of abundant scar tissue. Small cystocele present. There are two fistulæ—the right one-eighth inch in diameter to the right lateral side and the left quarter inch in diameter to the left lateral side. Exposure of the right fistula difficult and entailed very wide lateral dissection. The right sutured with 2×00 catgut vertically. The left sutured with 2×00 catgut transversely. Result, cured.

*Case 25*.—Aged 22. One para. Complaints of dribbling of urine for two months following difficult and prolonged labour. The trouble started after the third day of delivery. Has a large fistula admitting two fingers just behind the symphysis pubis. Bladder well prolapsed. Mobilization easy. Sutured by double 0000 Lembert's suture, transversely. Result, cured.

*Case 26*.—Aged 32. Two para, both stillborn. Six years ago was delivered of a dead child. Fifteen hours in second stage. Forceps applied. Retention of urine for fifteen days after labour, then dribbling of urine. Twenty-five days afterwards was operated on vaginally unsuccessfully. Pelvic measurements—7½, 8½, 7½ and 3 inches. There was a small fistula admitting a thick probe at junction of urethra and bladder. Scar tissue + +.

*Operation*.—16th September, 1936. Cervix high and fixed by scar tissue. Large rectocele. Mobilization difficult owing to cervix being fixed by scar tissue. Fistula also adherent to rami of pubes. Fistula sutured 2×00 catgut. Transverse suture. Result, cured.

*Case 27*.—Aged 25. Four para—first dead, second alive, third and fourth born dead. Complaints of watery discharge per vaginam for one month. Dribbling of urine commenced ten days after delivery one-and-a-half months ago. Labour pains began at 7 p.m. Next day at 12 noon the head was born. The pains then ceased and there was no advance until 6 p.m., when four *dais* pulled out the dead child. Dribbling of urine commenced after ten days. Pelvic measurements—7½, 8½, 6½ and 3 inches.

*Operation*.—16th September, 1936. Fistula as large as little finger at junction of bladder and urethra. Bound down to the right side of descending ramus of pubis. Easily mobilized. Sutured with 2×00 catgut. Bladder neck plicated with three interrupted no. 1 sutures. Result, cured.

*Case 28*.—Aged 26. Dead baby born in October 1935 after four days' labour. Three weeks later she found that urine was dribbling from the vagina. Pelvic measurements—8, 8½ and 5½ inches. Outlet 1½ inches. Vaginal examination showed a recto-vaginal fistula. The urethra is completely destroyed and absent. Scar tissue + +.

*Operation*.—29th September, 1936, for recto-vaginal fistula and plastic for stenosed vagina. There was a transverse posterior bar of fibrous tissue two inches from the vaginal outlet, contracting the vagina to one finger. Recto-vaginal fistula, size of one shilling, on the left side bound to the ramus of the pubis by fibrous tissue. Fistula extends to the anal canal. Free mobilization and suture by 2×00 catgut. Author's modification of Schuchardt's incision for flap to insert in vagina.

11th October. The external wound had healed. The flap inside the vagina is united except for a small raw area near front part.

30th October. Operation for vesico-vaginal fistula. The urethra was completely absent. Fistula mobilized and a tube from the bladder formed for the new urethra. Tissues split and undercut under the symphysis at old urethral site. This formed a bed for urethra. The flaps sutured over.

25th November. The urethra has retracted to half its length but there is complete control of micturition. Discharged cured.

*Case 29*.—Aged 14. One para. Six months ago dead baby removed with instruments by three *dais*, following 72 hours' labour. Second stage 48 hours. Now complains of incontinence of urine.

*Operation*.—23rd October, 1936. The fistula is urethral and is high up behind a horseshoe-shaped fold which is the vault of the vagina. Scar tissue + +. No evidence of cervix or urethra. Left Schuchardt's incision. Urethra and bladder mobilized. Poor exposure due to difficulty in working under narrow pubic angle. Peritoneal cavity accidentally opened—re-sutured. Only possible to insert one transverse suture. Prognosis, bad.

*Result*.—On 24th November, a pin-hole fistula remains which will possibly heal up itself. If not, to return in two months. There is considerable sphincter control and only slight dribbling.

18th December. Returned for examination. Fistula has healed. Now has complete control. Result, cured.

*Case 30*.—Aged 29. Four para. History of last labour.—Admitted to hospital after being 70 hours in labour. Membranes ruptured 63 hours previously. Attended by four *dais*. Oedematous and contused labia and vagina. Bladder distended. Vaginal discharge foul and stinking. No *fœtal* heart sounds. Albumin in urine + + +. Temperature 100°F. Pulse 110. Face presentation. Craniotomy and episiotomy performed. Vaginal laceration stitched. Normal puerperium. Ten days later complained of dribbling of urine from vagina. Measurements 8½, 9½, 7½ and 3 inches.

*Operation*.—25th October, 1936, for vesico-vaginal fistula. Fistula is to the left and two-and-a-half inches from the urethral orifice. Mobilized easily but found to be adherent behind the left side of symphysis. Two 0000 Lembert's suture. Result, cured.

*Case 31*. Aged 30. Eight para. Last eight months ago. Pelvic measurements—8½, 10, 6½ and 3 inches. Complaints of dribbling of urine per vaginam. Duration of a dead child. Spleen enlarged six fingers below the costal margin. General condition poor.

*Operation*.—8th December, 1936. Fistula ½-inch in diameter at junction of vagina and cervix. Cystocele present. Mobilization easy. Fistula closed by two vertical 00 Lembert's suture. Anterior colporrhaphy. Prognosis good as operation was extremely easy and tissues in good condition.

*Post-operative condition*.—Complete anuria for 48 hours. On the third day temperature 100°F., pulse 140. Blood-stained urine, three cuneces, passed. Diagnosed as blackwater fever. Treated as such. Died on the fifth day after operation. Urine passed was never more than three ounces per day.

*Case 32*.—Aged 25. Married 15 years. One para. Full-term dead baby four months ago; delivered with (Continued at foot of next page)

# TREATMENT OF MALARIA IN CHILDREN WITH ATEBRIN-MUSONATE\*

By R. K. DE, L.M.F., D.T.M.

Assistant Medical Officer, Talap Tea Estate, Talap, Assam

## Introduction

THE difficulty in giving quinine by mouth due to its bitterness and uncertainty of the amount retained when given are the most important drawbacks experienced in treating children with malaria, especially in tea-garden hospitals at the height of the malarial season, when one or two compounders have to administer quinine orally to 40 to 50 children or more three or four times a day. Atebrin by mouth is almost equally difficult. In view of the above facts and encouraged by the good results reported by many workers of the two-injection method of treatment with atebrin-musonate, it was decided to try this method of treatment in children in tea-garden practice. If such a method of 'rapid treatment' would be effective and practicable and without any risk, it would certainly be of great advantage to tea gardens from the economic point of view, as this would do away with the present hospitalization period of seven to ten days for the mothers and their

\*Being a paper read at a meeting of the Assam Frontier and Budla Beta Medical Society held on 16th January, 1937.

(Continued from previous page)

forceps, after 20 hours' labour. Urine commenced dribbling per vaginam on the following day. Patient has osteomalacia. Thighs flexed on trunk.

*Operation.*—10th November, 1936. Urethra was displaced to the right and opened at the junction of the anterior and middle third of the labium. Large fistula one inch in diameter involving upper part of urethra and bladder. Bladder prolapsed and adherent to the symphysis and both rami. Mobilization difficult. Urethra freed and correctly sited. Fistula closed and sutured to urethra. Prognosis hopeless.

Seen again on 18th January, 1937. Has control over micturition. Urine passed three or four times daily.

*N.B.*—The difference between prognosis and result.

*Case 33.*—Aged 32. Gave birth to dead child ten years ago, after four days' labour. Attended by five *dais*. Urine passed per vaginam two days after delivery. Has had three previous operations.

*Operation.*—4th December, 1936. Vagina is cone-shaped and half-inch in diameter at the apex. Cervix not seen. Extensive fibrosis of vault of vagina. Upper three-quarters of urethra absent. Large fistula one inch in diameter, in the base of the bladder. Left Schuchardt's incision. Mobilization difficult owing to scar tissue. Urethra freely mobilized. Closure by only one suture possible. Bladder and urethra covered by borrowing flaps from the lateral wall of the vagina.

Prognosis not good owing to necessity of suturing through fibrous tissue and imperfect mobilization.

23rd December. Urine good. Small fistula admitting fine probe remaining. Second operation will certainly close it. Control good. Result, partially cured.

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children and render necessary a period of not more than two or three days; thus loss of labour to the management, especially in the plucking season, would be saved.

The experiment was carried out in a tea garden in Upper Assam from 14th August, 1936, to 20th September, 1936, and all children with uncomplicated malaria from 6 months to 6 years of age (only three children were above 4 years) were treated with atebrin injections. The total number of cases was 50. Table 1 shows their age grouping, the ages being recorded from the garden birth register, with four exceptions. Two injections were given—one every 24 hours (only two cases were given a third injection)—the dose being 0.1 gm. of 'injectable atebrin' dissolved in 3 c.cm. of distilled water and the injection given into the buttock. No subsequent oral treatment was given. Before beginning treatment, the diagnosis was confirmed by blood examination. Daily thick and thin films were taken from each case and this was continued until the blood was negative for three consecutive days; a blood slide was recorded as negative when no parasite could be found by searching the whole thick film. The physical development of children was noted. The splenic enlargements were roughly measured on the first and fifteenth days. Hæmoglobin was estimated on the first, seventh and fifteenth days by Tallqvist's scale.

TABLE I

Showing age grouping

6 months to 1 year	..	..	..	12
1 year to 2 years	..	..	..	16
2 years to 3 years	..	..	..	10
3 years to 4 years	..	..	..	9
4 years to 6 years	..	..	..	3
TOTAL				50

## Observations

*Temperature and other symptoms.*—The effect on the temperature was striking. In most of the cases this came down within 24 hours, *i.e.*, before the second injection. The average time for the temperature to settle down to normal was 1.33 days after beginning treatment.

Within a few days of treatment, parasites reappeared in the blood in six cases without any fever and disappeared spontaneously. In nine cases fever returned—four without and five with parasites. Amongst the latter five, only in two cases, the fever being high, a third injection was given, and this without any ill effect in one case on the sixth day and in the other on the eighth day—the ages being 4 years and 14 months, respectively.

Nine cases were gravely ill on admission—two with hyperpyrexia, five with convulsions, one



with diarrhoea and one with dyspnoea. In all these cases, except one with convulsions, the grave symptoms were rapidly controlled after one injection. The excepted case was a very bad one admitted with fever, bilious vomiting and convulsions, a heavy malignant tertian infection, age 1½ years. The child died 19 hours after admission, one injection having been given. Convulsions continued during the whole of this period.

### Parasites

The parasites disappeared from the peripheral blood on the average in 2.04 days after beginning treatment.

Subtertian parasites disappeared earlier than the benign tertian and in mixed infection subtertian parasites disappeared first in all except two cases in which they disappeared at the same time. This finding is in conformity with the finding of Flack, Majumdar and Goldsmith (1936). Parasitic counts were not done in this series. In one case, however, parasites appeared to be definitely increased after the first injection. This phenomenon has also been recorded by Carman and Cormack (1936). In four cases crescents were found on admission and these persisted after treatment. In 10 cases crescents appeared a few days after treatment and in one of these even half-grown crescents were encountered two to three days before the appearance of full-grown crescents.

TABLE II

### Showing parasitic incidence

Malignant tertian	..	28
Benign tertian	..	14
Malignant tertian + benign tertian	..	8
TOTAL	..	50

TABLE III

### Showing persistence of parasites in days after beginning treatment

Malignant tertian	..	1.89
Benign tertian	..	2.15
Both	..	2.04

### Spleen

On admission, 45 cases (excluding the child that died) had enlarged spleens and by rough measurement reduction in size was noticed in 22 cases.

### Physique

The physical development of four children was under average. In these no modification of dose was made and no definite sign of intolerance was noticed.

### Toxicity

Hecht (1933) has shown experimentally that 'atebrin is a drug of mild and uncharacteristic toxic properties.....the central nervous system and especially the cerebrum are stimulated by lethal doses'. Col. Dunn (1936) reports that during the 1934-35 malaria epidemic in Ceylon where atebrin-musonate was extensively used by Briccliffe and others, there occurred in a certain percentage of cases toxic manifestations such as collapse, convulsions and even death a few minutes to a few hours after injection and that children are specially liable to such collapse and convulsions.

In this series no immediate fatality occurred. Convulsions in five cases and restlessness with vomiting in one case were noticed after injection. The details are given below:—

Case 1.—Girl, aged 1½ years, physique under average, M. T. heavy, Hb. 45 per cent, was admitted with fever. On 1st September, 1936, first injection was given; there were convulsions for a few minutes about three hours after. Next day second injection was given; recovery was uneventful. On 26th September, 1936, admitted again with febrile recurrence, B. T. moderate (a reinfection); a single injection was given; recovery was uneventful.

Case 2.—Boy, aged 6 months, physique good, M. T. heavy, Hb. 60 per cent, was admitted with fever. On 1st September, 1936, first injection was given; shortly after this, convulsions occurred for a few minutes. Next day second injection was given; recovery was uneventful. On 2nd October, 1936, admitted again with febrile recurrence, B. T. moderate (a reinfection); a single injection was given and shortly after this convulsions occurred for a few minutes.

Case 3.—Boy, aged 3½ years, physique good, M. T. heavy, Hb. 70 per cent, was admitted with fever. On 18th September, 1936, first injection was given; convulsions occurred for a few minutes about an hour after. Next day second injection was given; recovery was uneventful.

Case 4.—Girl, aged 1½ years, physique good, B. T. moderate, Hb. 65 per cent, admitted with fever. On 18th September, 1936, first injection was given and no untoward symptom followed. Next day second injection was given; convulsions occurred for a few minutes about half an hour after.

Case 5.—Boy, aged 2½ years, physique average, M. T. and B. T. heavy, Hb. 40 per cent, was admitted with fever and diarrhoea. On 22nd September, 1936, first injection was given; there were convulsions for a few minutes about two hours after. Next day second injection was given, recovery was uneventful. On 20th October, 1936, admitted again with febrile recurrence, B. T. moderate (a relapse or a reinfection); a single injection was given; recovery was uneventful.

Case 6.—Girl, aged 3½ years, physique average, M. T. and B. T. heavy, Hb. 65 per cent, was admitted with fever and history of convulsions. On 8th October, 1936, first injection was given; no untoward symptom followed. Next day second injection was given; restlessness with vomiting occurred about four hours after; slept under bromide.

In cases 1, 3 and 5, we were not inclined to hold atebrin responsible for the convulsions, as there was no such symptom following the second injection nor did such symptom follow the injection during the febrile recurrence in cases



1 and 5. Such convulsions were most probably due to the heavy malarial infection which these cases had. We have seen similar symptoms in malarial cases after quinine injection as well, but we were not disposed to hold quinine responsible for those.

Case 2 is interesting because of the fact that convulsions also occurred after the injection was given for the febrile recurrence. Is it because of 'specific sensitivity' as hinted at in the editorial in the *Indian Medical Gazette* of December 1935?

Only in cases 4 and 6 could the symptoms possibly be attributed to atebirin. They apparently looked well and had no temperature nor any other symptom at the time of second injection.

Another case is worth mentioning and may be of interest to compare with one in Col. Dunn's (1936) records. This case of Dr. Fernando's died two months after atebirin injection and post-mortem examination revealed the case to be one of atebirin poisoning. The details of my case are as follows:—

Boy, aged 10 months, physique good, M. T. moderate, Hb. 65 per cent, was admitted with fever on 20th August, 1936. Two usual injections on consecutive days were given. Recovery was uneventful. No recurrence of fever or parasites was noted afterwards. On 21st October, 1936, i.e., two months after, the case was re-admitted to hospital with a sloughing ulcer on perineum of about a week's duration. There was neither fever nor any other constitutional disturbance. Next day the child suddenly died after a convulsive attack of a few minutes' duration. The cause of death seemed to me obscure. As post-mortem examination was neither done nor possible, no definite conclusion could be arrived at.

I mention this case because this sudden death, without any definite cause, happened to be in a case of this atebirin series.

Slightly yellow discoloration of the skin was noticed in one case for two weeks.

**Relapse.**—An attempt was made to study relapses by following up the cases and by examining the blood every fortnight. It was possible to follow up these cases only for a month and a half. In a highly malarious area where risk of reinfection is great, it is difficult to distinguish relapses from reinfection and hence this observation has not been of much value. Thirty-four cases had parasitic relapse or reinfection (including some certain cases of reinfection).

Of these 34 cases, nine came under treatment with febrile recurrence (there might have been more such cases who were not brought to hospital or in whom fever passed unnoticed by the mothers). It may be noted here that these cases with febrile recurrences within the observation period of 45 days were treated again with a single injection of atebirin 0.1 gm. with good clinical response.

### Summary and conclusion:

(1) Fifty children were treated with two consecutive daily doses of atebirin by intramuscular injection.

(2) This treatment controlled the clinical symptoms rapidly and the effect on temperature was remarkable.

(3) The treatment freed the peripheral blood of malignant tertian infection earlier than benign tertian.

(4) The treatment did not destroy crescents nor did it prevent the formation of them.

(5) Post-treatment complications were unexpected and caused anxiety.

(6) There was no abscess formation and no inflammatory reaction in any case.

(7) The dose given seemed adequate for the average children of from 6 months to 6 years in tea gardens.

Taking all the above into consideration, although the number of cases is small, it is concluded provisionally that two injections of atebirin can be regarded as an efficient course of treatment in acute malaria and its complications in children. The rapidity with which the temperature is controlled and the facility of administration of this method of treatment are really distinct advantages. The drawbacks are the toxic after-effects in some cases and its high price. The latter is largely overcome by the saving in hospital costs due to reduction in the treatment period, and will be more so if the relapse rate is also lessened by this method.

### Acknowledgments

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# VITAMIN A, AS DETERMINED BY THE BLUE UNITS OF THE ANTIMONY TRICHLORIDE TEST, IN THE LIVERS OF MALNOURISHED CHILDREN

By LUCIUS NICHOLLS, M.D., B.C., B.A. (Cantab.)

THE livers used in this investigation were obtained from children of the indigent classes dying from various causes in the Colombo hospitals.

Carr and Price (1926) originally described a method of determining the amount of vitamin A by the use of antimony trichloride. A quantity of the liver, or other organ, to be tested was dried and extracted in a Soxhlet apparatus, and the test carried out with the extract. This is a tedious procedure when large numbers of tests are being done, and Moore (1930) modified it by dissolving the samples in 5 per cent caustic potash and shaking this up with a little alcohol, and extracting the fats and vitamin A by adding ether and shaking the mixture.

When working in a hot and damp climate special precautions must be taken to prevent the presence of moisture in the final extract.

The method which has been followed is that described by Davies (1933) with a few small modifications :—

## Method

Five grammes of liver are weighed in a 50-c.cm. beaker and minced with scissors, 10 c.cm. of 5 per cent solution of KOH is added and the material is transferred to a 50-c.cm. conical flask. The mixture is digested in an oven at 100°C. until there is complete solution. It is poured into a 100-c.cm. graduated and stoppered funnel and 5 c.cm. of ethyl alcohol is added and well shaken, 50 c.cm. of ether is added and the shaking repeated. The layers are allowed to settle out and the aqueous layer is run off and discarded; 5 c.cm. of water is added and vigorously shaken with the other layer; the aqueous layer settles and is discarded; the washing to remove the KOH is completed by gentle agitation with 50 c.cm. of water (strong shaking produces an emulsion which will not readily settle into layers). The ether fraction is passed into a small flask containing anhydrous sodium sulphate and allowed to stand for a few minutes; this absorbs the water; the ether is filtered through a little more anhydrous sodium sulphate in a dried sintered glass funnel leading into 100-c.cm. wide-neck squat flask. The content of the flask is evaporated in a water bath, and, to prevent condensation of moisture, the flask is fitted with a cork through which two tubes pass—one leads to two wash bottles, the first containing sulphuric acid and the second caustic potash, and the other leads to a suction pump, thus only dried air enters the flask. The residue after evaporation should be a clear and transparent oil; it is dissolved in 2 c.cm. of dry chloroform; a blood pipette delivers 0.02 c.cm. of this solution into a 1 cm. Lovibund cell and the volume is made up to 0.5 c.cm. Two c.cm. of antimony trichloride in dry chloroform (Carr-Price reagent) is added from a B.D.H. automatic pipette; if a blue colour appears it is quickly matched in a Lovibund tintometer with blue and yellow glasses; similar tests are made until the content of the cell is matched by Lovibund blue units, and the necessary yellow glasses. The calculation is made as follows:—

Five blue units  $\times$  2.5 volume of reaction mixture  
 $\times$  (2) amount of chloroform.

Amount giving 5 blue units  $\times$  grammes of liver (5).

Supposing 0.2 c.cm. gave five blue units, then—  
 $\frac{5 \times 2.5 \times 2}{0.2 \times 5} = 25$  blue units per gramme of liver.

When a large number of blue units is present it is necessary to dissolve the evaporated residue in a greater quantity of chloroform, such as 5 or 10 c.cm.

Most of the livers of the children were checked against rabbits and bullocks' livers. The former ranged from 95 to 220 blue units per gramme, whereas the latter ranged from 1,250 to 2,350 blue units per gramme. This is not an exact check but it serves as a fairly satisfactory control when there is little or no vitamin A in the livers tested.

Seventy-seven livers have been tested; four were from stillborn children and the others from children of various ages.

## Stillborn children

The four stillborn children were from very anæmic mothers who were between the seventh and eighth months of pregnancy. The results were :—

Blue units in gramme of liver.	Mother's hæmoglobin index.
350	45 per cent
25	anæmia ++
40	50 per cent
5	45 per cent

This shows great variation in the amounts of vitamin A in the livers of those stillborn children; but there is no correlation between the blue units and the degree of anæmia of the mother.

## Livers which showed the highest blue units

The livers of the 73 children were in most cases from children who had died within a few days of entering hospital. The livers which showed the highest blue unit values were :—

Age.	Sex.	Cause of death.	Blue units per gramme.
12	M.	Endocarditis	155
10	M.	Killed in motor accident.	125

The boy who died of endocarditis had been in hospital for some time and had been well fed. The boy killed in the motor accident appeared well nourished but he belonged to the working classes and possibly about 125 blue units may be taken as a standard for this class of persons in the tropics, who usually live on diets containing little or no vitamin A and not large quantities of its precursor.

## Livers which showed no blue units

There were 15 livers in which not a trace of blue appeared in the mixture containing the extract from 2 grammes of liver, the maximum

amount used in these tests. The following table gives a few details of those :—

the amount of improvement the skin eruption had undergone during the stay in hospital,

*Livers showing no blue units in 2 grammes*

Number	Age	Sex	Clinical condition	Degree of emaciation	Length of stay in hospital
1	10 months	F.	Bronchitis, malnutrition with œdema	+	2 days
2	3 weeks	M.	'Congenital syphilis'. Mother's Wassermann + +.	+	2 "
3	8 years	F.	Nutritional œdema	?	2 "
4	1 year	F.	Colitis	+	7 "
5	4 weeks	F.	'Prematurity'	+ +	5 "
6	12 years	F.	'Phthisis with œdema of hands and feet	+	4 "
7	4 "	M.	Chronic diarrhœa	0	8 "
8	2 "	F.	Enteritis and marked phrynoderma	+ +	6 "
9	15 "	M.	Ankylostomiasis and anæmia	?	5 "
10	5 "	M.	Brain abscess	0	7 "
11	6 months	F.	Infantile debility	+ +	3 "
12	6 "	M.	Gastro-enteritis	+ +	4 "
13	17 years	F.	Phthisis	+ +	10 "
14	5 "	F.	Anæmia, keratomalacia and phrynoderma	+	4 "

It will be noticed that the livers of three children with œdema showed no blue units, two of these (numbers 1 and 3) were typical cases of nutritional œdema. The parents of number 6 were indigent and it is probable that she had been poorly fed.

There were four cases of 'enteritis' (numbers 4, 7, 8 and 12) and two of these, numbers 4 and 7, had been in hospital for a week or more and had received cod-liver oil and other substances rich in vitamin A; and it appears a justifiable conclusion that vitamin A is not readily absorbed from a disordered alimentary tract.

There were only two patients who are recorded as showing marked phrynoderma, namely numbers 8 and 15, and the latter patient had keratomalacia.

Two patients (numbers 9 and 11) might equally well have been diagnosed as suffering from malnutrition.

Thus in 11 out of the 15 patients there was definite evidence of malnutrition or defective absorption.

The diagnoses in the four remaining cases were congenital syphilis, prematurity, brain abscess and phthisis.

*Livers showing blue units*

It is the routine practice in the hospital, to which most of the children had been admitted, to give all patients adequate amounts of fish-liver oils, or other preparations rich in the fat-soluble vitamins; consequently positive antimony trichloride tests with the livers of children who have been in hospital for many days are of little or no significance except that it may indicate that satisfactory absorption has taken place.

Eight patients, who had varying degrees of phrynoderma, had livers which give various numbers of blue units per gramme, but unfortunately no records were kept which indicate

There was a patient, aged 7, who had phrynoderma and keratomalacia and the liver showed 35 blue units per gramme, but the child had been in hospital for 10 days and appears to have died of a terminal bronchitis, and during the stay in hospital had received considerable amounts of preparations containing vitamin A.

It is noteworthy that the only three cases of nutritional œdema in this series also showed an absence of blue units.

*Discussion*

Many of the poorest class children in Ceylon are weaned to a diet poor in proteins and deficient in all vitamins, and it is not astonishing that various signs and symptoms of malnutrition are prevalent among them. In many cases the deficient diets produce debility paving the way for infections which lead to death.

The œdemas of malnutrition are usually attributed to a deficiency of vitamin B, and in many cases there is also a deficiency of proteins, and probably this occurred in the three cases reported here, but the fact that vitamin A was also deficient without the presence of signs usually attributed to this deficiency serves to show that a human diet which is deficient in one respect is often deficient in many others; and further that the absence of any particular signs does not necessarily exclude any particular deficiency.

The results in cases of enteritis indicate a defective absorptive power of the alimentary tract for fat-soluble vitamins; this is in accordance with the general experience that fats are not well absorbed when there are digestive disturbances. Carotene, the precursor of vitamin A, may be more easily absorbed, and, if so, is indicated in cases of enteritis; this may explain the widespread use of extracts of leaves in diarrhœas and dysenteries among the masses of the tropics.

(Continued at foot of opposite page)

## A SYNCOPAL FORM OF ANGINA PECTORIS

(AN ELECTROCARDIOGRAPHICAL STUDY)

By J. C. GUPTA, M.B. (Cal.), M.D. (Cologne)

GALLAVARDIN (1922) described a form of angina pectoris which was characterized by attacks of syncopal syndrome something like that of Adams-Stokes'. He considered these in relation to a temporary vagal inhibition which is exaggerated in this condition. Such cases are, however, very rarely met with. The following case therefore seems to be worth reporting :—

The patient was a retired clergyman, aged about 56 years. One afternoon at about 2 p.m., while attempting to catch a train for which he was waiting on the platform, he felt vertigo and giddiness and fell down unconscious. He remained in this condition for more than two hours. On admission into the hospital he was still unconscious and had a pulse rate of about 30 per minute and a blood pressure of about 98/60 mm. Hg. After atropine and cardiazol injections, he soon regained consciousness and began to complain of pain in his chest behind the sternum. The pulse rate rose to about 60 per minute. The blood pressure too showed a rise of about 130/90 mm. Hg. Five months ago, he said, he had a similar attack of momentary loss of consciousness which was overlooked at that time.

The general condition of the patient remained fairly good thereafter. The precordial pain was all that he complained of. The pain was located in the right side of the chest close behind the sternum. It came at intervals of about 15 to 20 minutes. It was of a spasmodic character, 'twisting' in nature. It had a tendency to radiate towards the suprasternal notch. The

(Continued from previous page)

Cramer (1933) has reported some experiments on rats in which he has shown that when diets are deficient in vitamin B, there is defective absorption of vitamin A, and this may lead to xerophthalmia. This suggests that there are interactions among the vitamins, and whatever signs and symptoms may be present in all cases the correcting diets should be ample in all constituents.

### Summary

A short description is given of a method of determining the amount of vitamin A in livers by the antimony trichloride test.

There was great variation in the numbers of blue units shown with the livers of stillborn children.

Fifteen out of 63 livers showed no blue units.

Four of these livers were from children with 'enteritis' and seven from children showing other signs of malnutrition.

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 Moore, T. (1932). *Lancet*, Vol. II, p. 669.

characteristic radiation along the arm was absent. He did not feel any pain during sleep which was undisturbed owing to a soporific he was taking.

Physical examination revealed an emphysematous condition of the chest. The heart was more or less centrally placed. There was no apparent enlargement. Heart sounds were almost inaudible. There was no oedema or rise of temperature. Blood examination showed a slight degree of anaemia, haemoglobin 50 per cent, and 2,900,000 red cells; the Wassermann reaction was negative. Biochemical examination gave a practically normal picture. Urine examination was negative. An x-ray examination of the chest showed no abnormality.

An electrocardiographical examination was undertaken on the third day after the attack. It revealed the cardiac nature of his troubles (*see later*).

As he showed no further alarming cardiovascular reactions, he was treated with injections of grape sugar to improve his cardiac condition, and he left the hospital after about a fortnight.

He was readmitted into the hospital after a fortnight with a similar history of another cardiac attack with loss of consciousness associated with convulsive movements of the limbs. This time too he complained of pain in the chest which was very similar to that described above. An electrocardiographical examination undertaken this time also revealed an exactly similar picture.

### Comment

The electrocardiograms were very peculiar and, from the point of view of diagnosis, of the utmost importance. The ventricular complexes in leads II and III were of abnormal amplitude, notched near the apex of the extremely deep S deflections and were also widened beyond 0.12 seconds. The T and the main ventricular deflections were in opposite direction with respect to each other. The S-T segments were well above the iso-electric line. In short, in these two leads the picture resembled very much a right-bundle-branch block. The lead I was, however, very atypical. The amplitude of excursions was very small. The complexes were widened and thickened and the T deflections were almost iso-electric. The whole picture taken together was thus atypical for a pure right-bundle-branch lesion.

Mahaim (1927) has drawn attention to the fact that pure cases of right-bundle-branch block may be comparatively rare to find in as much as a clean severance of the right-bundle branch is not usually seen in human pathology analogous to that in an experimental animal. More commonly, a mixed type of right-bundle-branch block may be obtained clinically. From an anatomical consideration this seems very reasonable, as will appear from the accompanying diagram. Mahaim has described two different types of right-bundle-branch lesions: 'Bloc mixte de la branche droite a type anterieur' and 'le bloc mixte de la branche droite a type posterieur' (a mixed anterior type and a mixed posterior type of right-bundle-branch block). These can be recognized in electrocardiograms. In the first case the amplitude of excursions is very high in leads II and III, and lead III may be small and atypical, while in

the latter case the leads I and II may be large and lead III comparatively insignificant.

case becomes clear. The shaded area in the diagram may represent the localization of the

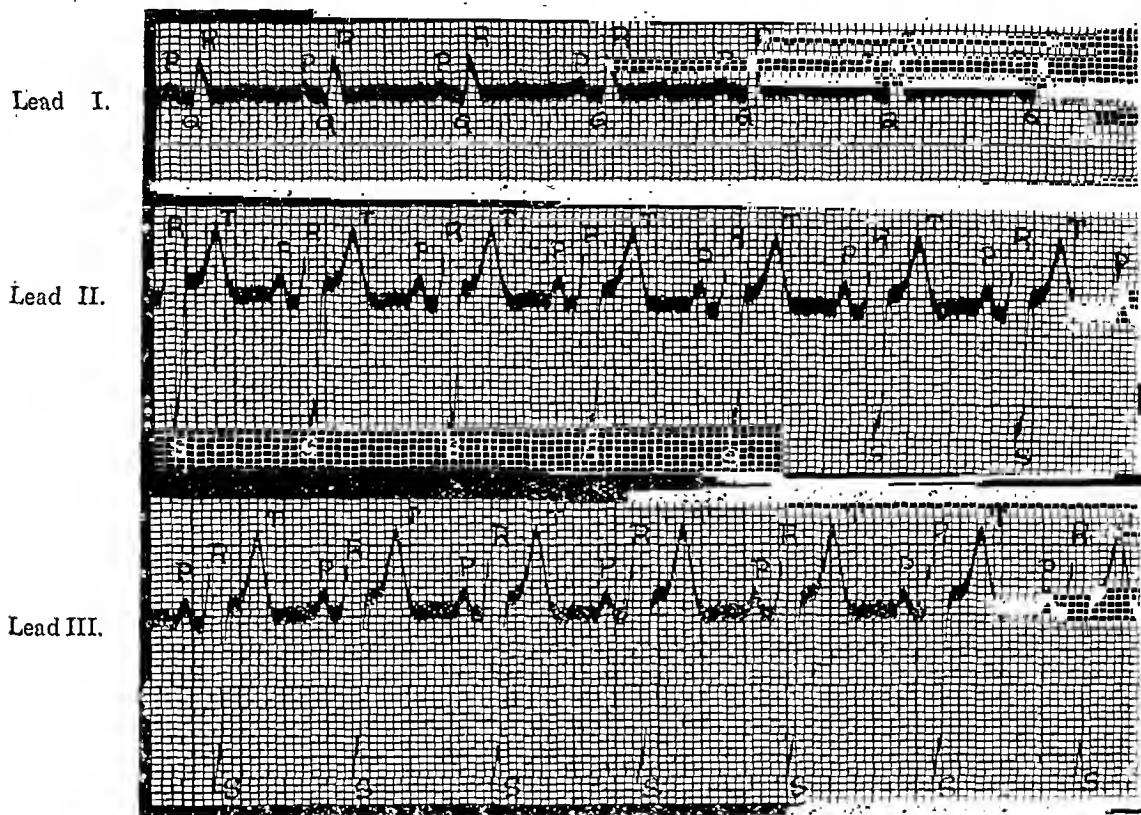


Fig. 1.—The electrocardiogram. Three leads. Note especially the widening of Q-S; notching at the apex of the main ventricular deflections; 'T' waves in directional opposition to the main complexes. The picture is suggestive of a right-bundle-branch block. The lead I is atypical. It is inferred that the bundle lesion is a mixed one affecting the right branch and also the anterior part of the left-bundle branches. These are in the distribution of the arteria limbi dextra branch of the left coronary artery.

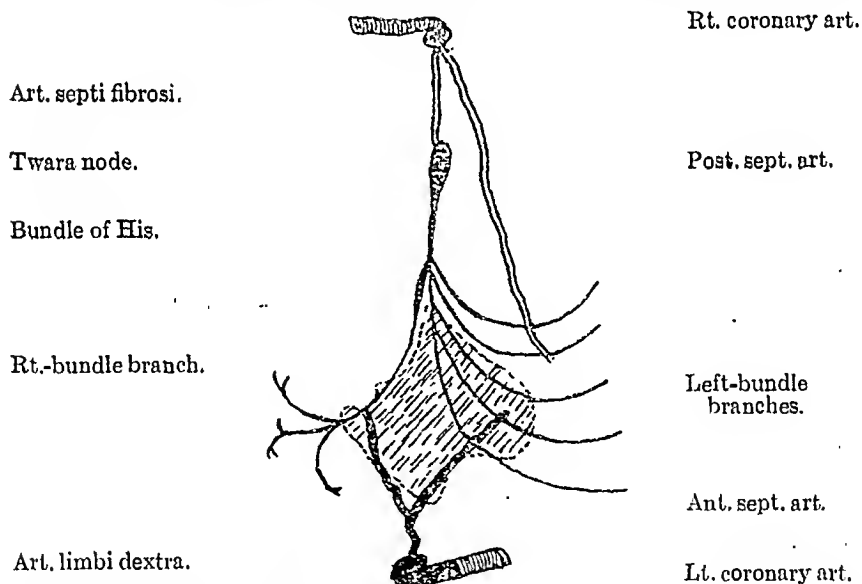


Fig. 2.—A schematic diagram to show the vascular supply of the conducting system. The probable localization of the lesion in mixed right-bundle-branch block is shown. The shaded area represents the ischemic region and the darkened vessels the affected vascular zone.

In the light of the above facts, the interpretation of the electrocardiograms of the present lesion and the obliterated artery of the affected vascular zone. The arteria limbi dextra branch

of the left coronary artery supplies the right-bundle branch, exclusively, and a twig from this latter supplies the anterior portion of the left-bundle branches; hence the name 'anterior type'. Consequently, if it is assumed that the lesion is central to the branch supplying the left-bundle branches, it is easy to understand that the lesion must be of a mixed variety affecting the portion of the left-bundle branches as well.

This seems to be the explanation of the case so far as can be made out from the electrocardiographical examination. In the absence of any marked cardiovascular reactions, which are usually a necessary accompaniment in cases of coronary thrombosis, one is certainly justified in excluding a diagnosis of coronary occlusion in this case.

It remains still to explain the clinical symptoms of the case in relationship to the electrocardiographical findings: apart from the precordial pain, the most outstanding symptoms of the case were (a) history of attacks of loss of consciousness which is prolonged to over two hours in one instance, and (b) the bradycardia which is associated with this. One would be tempted to bring these in relationship to Adams-Stokes' syndrome. The loss of consciousness in Adams-Stokes' syndrome, however, is very transient, since it is a temporary ventricular asystole which is the direct cause of a temporary anæmia of the brain and the loss of consciousness results from this. An asystole of the ventricles extending more than 10 seconds is incompatible with life. A complete loss of consciousness in Adams-Stokes' disease lasting for two hours is, in fact, unknown.

It is more reasonable to suppose that the attacks in the present case may be of the nature

of vasovagal fits (Thomas Lewis, 1933) and of, essentially, a vagal phenomenon. It is quite possible that areas in the neighbourhood of the ischemic zone, as shown by the shaded lines in the diagram, have been rendered hyper-irritable. This has caused a stimulation of the vagal nerve endings. Thus, the loss of consciousness, and also the temporary bradycardia, may be looked upon as reflex effects in consequence of these. Heimann (1929) believes that, in certain acute myocardial processes, a transient heart-block may be brought about in this way, possibly due to a direct spasmodic contraction of the artery supplying the bundle of His. Gallavardin also suggested a similar interpretation to explain his cases of a syncopal form of anginal attack.

### Conclusion

Thus the whole case is explained. We have a very remarkable case of anginal attacks associated with loss of consciousness and possibly a vagal inhibitory block. A mixed right-bundle-branch block, anterior type, has given us the clue to a diagnosis.

I beg to acknowledge my sincere gratefulness to Dr. I. Basu, visiting physician, Carmichael Medical College, for his kind permission to study this case in his wards and to publish it.

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## A Mirror of Hospital Practice

### A CASE OF TICK TYPHUS AT ALLAHABAD

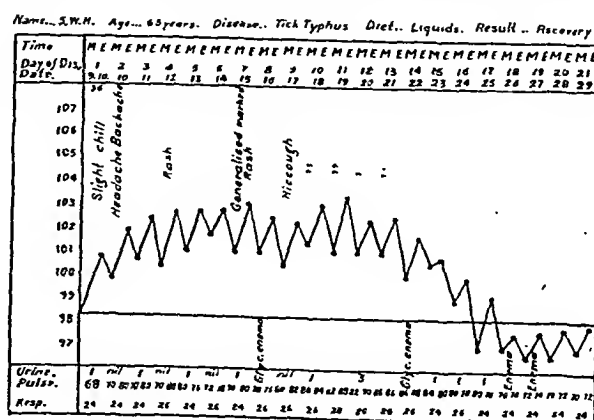
By R. N. BANERJI, B.Sc., M.B., B.S., R.B.  
Allahabad

TICK TYPHUS is comparatively rare in this region, specially in the plains. I have reported cases of tick typhus previously as it is believed that this disease is seldom observed in the indigenous population.

S. W. H., aged 63 years, male, had a sudden onset of fever on the 9th October, without prodroma, but with chill and headache. He was quite well before the attack. He got pains in the back and limbs and the temperature rose to 102°F. on the second day. On the fourth day of illness a papular rose-coloured rash appeared on the limbs, it faded on pressure and did not itch and it soon became generalized, affecting the trunk, extremities, the palms and soles and a little on the face. There was none on the scalp.

This rash was first red, then deep brown and later on did not fade on pressure. Some of the spots were from

4 to 8 mm. in diameter. At this stage the patient developed marked insomnia, showed signs of toxæmia,



had abdominal distension and developed hiccough which persisted for nearly four days. He looked very ill



and was restless. Constipation was present almost throughout; he was never unconscious but the temper was irritable, and he was apathetic. The temperature was of remittent type, ranging between 101° and 103°F., and the pulse was comparatively slow all the time. On the 8th day of his illness a few dry sounds and moist râles at the bases were noticed on examination of the lungs and he had a slight cough, but this cleared up by the 14th day. On the 15th day the temperature fell to normal, almost by crisis, and the next day the maximum was 99.2°F. Convalescence was rapid and uneventful.

During the illness the patient had œdema of the feet which rapidly cleared up as soon as there was remission. The urine during the fever showed albumin and casts but within two days of the remission it was normal. The blood was examined on the 9th day of illness and the total leucocyte count was 13,800. Widal against typhoid, para A and different strains of para B were done at the brigade laboratory and were completely negative in all dilutions. The blood pressure was 127 systolic and 80 mm. diastolic, which was more or less the patient's normal reading as recorded for several years.

The rash was so characteristic that there was little doubt in the diagnosis; in the enteric group there is leucopœnia, while in this disease there is leucocytosis and in enteric the rash is only a few discrete spots on the trunk and never on the soles or palms. The whole body looked spotted and the possible confusion at the very early stage was with smallpox. The rash persisted after the remission of fever and is fading away gradually; it has not yet disappeared completely (7th November, 1936), there being brown staining at the site of the spots. The patient's past history is devoid of any serious illness; in fact he always kept good health except for minor dyspeptic troubles.

The first case of tick typhus reported in 1916 in the *Indian Medical Gazette* was that of Major-General Sir John Megaw at Lucknow whose case was observed by me and whose blood examinations during the illness were done by me. Since then I have been on the lookout for these cases and have seen occasional ones in the plains but have never been able to find the tick on the patient. I record my thanks to Dr. Lahiri, the attending physician, for permitting me to report this case.

[Note.—It is to be regretted that the opportunity was not taken of testing the patient's serum reactions to different strains of proteus X, with the object of confirming the diagnosis.—EDITOR, *I. M. G.*]

## FATAL ANAPHYLACTIC SHOCK\*

By ARUN CHANDRA NAG, M.B.

*Bagerhat, Khulna District*

A boy, aged 2½ years, had been suffering from irregular febrile attacks associated with enlarged spleen and liver and progressive anæmia for about nine months. After failure of oral treatment by drugs, the nature of which is not known to the writer, intravenous injection of urea stibamine (Brahmachari) were commenced by a local practitioner. The injections were given at intervals of three or four days and after the fifth, amounting to 0.025 gramme, the boy began to vomit, the face was cyanosed and in a very short time (about a minute) the eyelids and tongue became enormously œdematous.

He was given two subcutaneous injections, the nature of which is not known; this brought about rapid amelioration of the symptoms. The doctor in charge of the case having refused to continue the treatment the parents took the boy home.

After six or seven weeks the irregular fever and other symptoms returned in a more aggravated form and the boy was taken to another practitioner. He was given 0.025 gramme of urea stibamine intravenously twice a week without any unfavourable signs until, again after the fifth dose, a similar anaphylactic attack occurred. This doctor also refused further treatment.

For about two months the boy appeared well but once again the fever returned and he was brought back to the last doctor who gave an intramuscular injection of 0.05 gramme of neostibosan, which was repeated three days later. On the ninth day after the first injection the boy was brought back to the doctor with an abscess at the site of injection. He wished to open it but the parents refused and the child was brought to the writer a few days later. The abscess was opened and took a month to heal.

Towards the end of this period the temperature began again to rise and the blood gave a positive formaldehyde reaction. Urea stibamine injections (0.025 gramme each) were again given at intervals of three or four days. The first four injections caused no discomfort but after the fifth, which was also 0.025 gramme, the face and tongue became at once tremendously swollen, the child vomited, and there was marked cyanosis.

Immediately 5 minims of adrenalin chloride (Parke, Davis and Co.) and ½ c.cm. pituitrin (Parke, Davis and Co.) were injected hypodermically but it had no apparent effect and, in spite of artificial respiration being employed, the boy died in about ten minutes.

I am publishing this note in the hope that some explanation as to why this boy exhibited the same symptoms on three separate occasions may be forthcoming.

[Note.—Attacks suggesting anaphylactic shock are not uncommon in patients under treatment by some of the pentavalent compounds of antimony. Napier collected notes on 13 cases and reported them in the November 1926 issue of this journal. He also referred to his own experience. In most of the cases the untoward symptoms followed the administration of urea stibamine, but as this was the drug most widely used at that time no special significance need be attached to this observation. Reports of such occurrences are much rarer than they used to be. Since neostibosan has been the principal drug used at the Calcutta School of Tropical Medicine these reactions have become very rare in our experience.

The attacks usually occurred after four or five injections, as in this case, but here the exceptional feature is that the patient reacted severely on three separate occasions and that the last reaction was so severe that he died; death is a very rare occurrence, recovery being the rule even after attacks that present very alarming symptoms.

It seems possible that the intervals between injections in this case were so long that the patient, instead of becoming desensitized, became increasingly sensitive to the drug.—EDITOR, *I. M. G.*]

\* Rearranged by Editor.

# Indian Medical Gazette

MAY

## THE NUTRITIVE VALUE OF INDIAN FOODS AND THE PLANNING OF DIETS

NOWHERE in the world has the recent revival in the study of nutrition had more important repercussions than in India. There is abundant evidence that a very large proportion of the population is undernourished and that this undernourishment not only affects the mental and physical energy of the individual but increases the morbidity and mortality of the multifarious infections to which he is subjected. Further, the more the matter is investigated the more sufferers from diseases due to specific food deficiencies do we recognize. On the other side, we have the very low economic status of the population as a whole, a common factor in the nutrition problem in almost any country but of exceptional importance here, and in addition innumerable racial and religious traditions and prejudices which complicate every attempt towards dietary improvement.

There is a tendency in this country to pause a little while before following any new medical 'fashion' and, though this sometimes saves us much wasted effort, as many of these 'fashions' are soon played out and forgotten, it sometimes leaves us a little behind other countries in the adoption, and the adaptation to our own particular conditions and needs, of genuine scientific advances.

For many years pioneers such as Sir Robert McCarrison have been trying to make India nutrition-minded, but it is only during the last few years that even the sanitarian has been impressed with the all-importance of the nutrition in determining the health of the people, and the practitioner would be even more behindhand had his interest not been stimulated by the spectacular, but also very important, recent work on vitamins.

The complaint is often made that this centering of attention on the 'protective' substances in dietary, i.e., vitamins and mineral salts, has withdrawn attention from the equally important energy-yielding substances, the protein, the fat and the carbohydrate. There has of course been a tendency to concentrate on the former substance, but the net result has been a focusing of far more attention on the subject of dietary as a whole. The worst side of the vitamin boom has been its commercial exploitation, as, even though the extensive advertising of vitamin preparations does help to draw attention to these important food factors, it also helps to create a wrong impression in the minds of not only lay but also medical readers.

Only a short time ago we deleted the following sentence from an otherwise quite useful contribution which has actually appeared in the *Gazette*:—'The patients were all poor and could not afford expensive patent medicines, such as vitamins, etc.' A more absurd misconception it would be hard to imagine, but it is quite easy to see how it may come about if a medical man allows his post-graduate reading to consist solely of a perfunctory perusal of commercial journals and trade circulars.

There is, however, no doubt that to-day in India there is arising a genuine and widespread interest in nutrition, and it has immediately become apparent that we are far behind, not only most Western countries but also many Eastern countries, in the matter of literature and data on this subject. There are innumerable American and some excellent English books\* on dietary, but most of these, except for the teaching of general principles, are of very little use to the worker in India. In the first place, the dietetic requirements of the people of India are not the same, either quantitatively or qualitatively, as those in temperate and cold countries, and attempts to draw up standard diets without appreciating this fact would lead to both waste and an unsuitable diet. Again, without the data available for foods peculiar to India, the dietitian is completely at a loss as he will not find in the analytical tables in the textbooks on diet any mention of the vast majority of the food substances eaten by the people here.

Data regarding the composition of various foodstuffs eaten in this country have been accumulating; the Nutrition Institute at Coonoor has devoted much of its energies to this important subject for a number of years and has published some of its findings from time to time, but recently the director, Dr. W. R. Aykroyd, has collected the available data regarding the food value, the protein, carbohydrate and fat, and the mineral and vitamin content of a very large number of Indian foods, and has tabulated them. This table has been issued by the Government of India in the form of a 'health bulletin'† so that this collected information is now available to anyone who is interested

\* Of these one of the best known is Robert Hutchison and V. H. Mothram's *Food and the Principles of Dietetics* (Edward Arnold and Company, London, pp. xxviii plus 634. Illustrated. Price, £1-1-0). The eighth edition has just been published. It is an invaluable mine of information on all subjects connected with diet in health and disease. All recent work has been incorporated and the influence of climate on diet is discussed. It is a particularly suitable textbook for the dietitian in India and, combined with Dr. Aykroyd's brochure on Indian foods as a local supplement, it should give him all the information he or she requires.

† The Nutritive Value of Indian Foods and the Planning of Satisfactory Diets. Health Bulletin No. 23. Published by the Manager of Publications, Delhi (Government of India). 1937. Pp. 48. Price, As. 2 or 3d. Obtainable from Thacker, Spink and Co. (1933), Ltd., Calcutta, and elsewhere.

and is prepared to spend the modest sum of two annas.

This brochure contains much other information that will be invaluable to those in India who have to judge or plan diets, whether they be medical men or otherwise. The general principles are dealt with briefly and figures are given for the caloric requirements of the average Indian. The author is on very sound ground when he says that the scale laid down by the League of Nations Health Organization is too generous for this country, and places the requirements of the average male doing 'easy-going agricultural or coolie work' at 2,500 to 2,600 calories. He places the protein requirements for a male adult at 65 grammes a day and the fat at 45 to 60 grammes: these figures are both below the European standard, but even these low figures are very often not attained in a diet that consists mainly of rice.

Of the mineral defects in the 'average Indian diet'—such a term is scarcely justifiable as the 'average diets' in different parts of India differ widely—that of calcium is the most pronounced, as often no more than 0.2 gramme, against the standard requirement of 0.68 gramme, is found. The iron requirements of the body are small and usually satisfied, but where there is loss of blood from any cause (e.g., hookworm disease) or excessive demand (e.g., pregnancy) the deficiency becomes patent.

Many dietaries are deficient in vitamin A on account of their very low content of animal fat. This deficiency Dr. Aykroyd suggests can be made up by taking leafy vegetables plentifully. He refers to the possibilities of red-palm oil as a valuable source of fat, and of vitamin A, on account of its high carotin content. The B vitamins are deficient in certain circumstances especially where the diet consists mainly of

milled rice, but this deficiency is easily remedied. The greatest danger of vitamin-C deficiency lies in the fact that milk is poor in vitamin C and that this vitamin is easily destroyed by cooking, but it presents no special problem in India, nor does vitamin-D deficiency which, though it does occur, is probably rarer than it is in other countries where the sunlight is not so active.

The main difficulty encountered by the nutrition worker is the economic one. Devise how you may, you cannot produce an adequate balanced diet for Rs. 3 per month, which is often all that is available. On the other hand, many diets that cost far more than this are still unsuitable, and it is ignorance rather than poverty that is the most important factor in determining malnutrition, as even the diet of the poorest is usually susceptible to improvement without additional cost. This point has been well brought out by Dr. Aykroyd. As a cheap addition to diets of children in institutions he has recommended 'skim milk', or 'skim milk' reconstructed from powder. Though this cannot be recommended for infants living on a milk diet, it is very suitable for the older children on a mixed diet, as it is little short of whole milk in its nutritive qualities and is particularly valuable on account of its relatively high animal-protein content; in these poor diets the fat must be made up by the addition of vegetable oils.

It is specifically pointed out that there are many gaps in our knowledge of the nutritive values of Indian foodstuffs, but enough is known to justify the compiling of this 'health bulletin'. Its publication will do away with one of the most serious handicaps under which the nutrition worker in India has been labouring.

## Special Articles

### PUBLIC HEALTH ASPECTS OF FILARIASIS IN INDIA\*

By M. O. T. IYENGAR, B.A., F.Z.S., F.R.S.T.M. & H.

ALTHOUGH filariasis is a widespread disease in India we have not sufficient information regarding the exact distribution and incidence of the disease. Megaw and Gupta (1927) mapped out the distribution of the disease in India based on answers to a questionnaire sent to medical officers in various districts (*vide map*). According to them the disease occurs on the eastern sea-coast of India, on the western coast in Surat and from South Kanara to

Travancore and in a few discontinuous patches along the Gangetic basin. As this map was constructed not on field enquiries but only on opinions of medical officers, it is not possible to estimate with any degree of accuracy the comparative intensity of filarial disease in different parts of India.

Sundar Rao has, in an unpublished article, worked out the distribution of filarial infection in India which is based partly on a rapid survey of some towns and, to a larger extent, on the examination of blood films from convicts in jails. The distribution of the infection in India, according to Rao, corresponds closely to that of the disease as shown by Megaw and Gupta.

A few investigations in local areas have also been carried out as, for example, in Cochin by Cruikshank and Wright, in Bihar and Orissa by Korke, in Puri by Das, in Trivandrum and

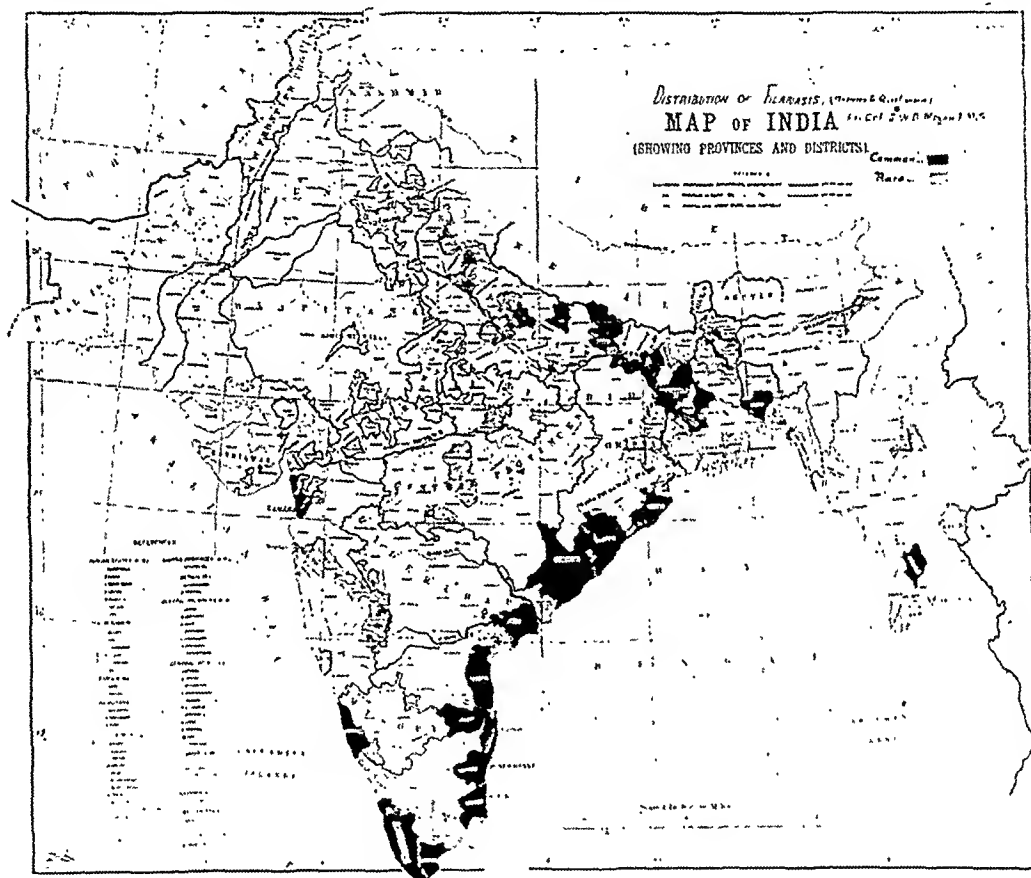
\*Being a lecture delivered at the Public Health Society, Calcutta, on 24th February, 1937. This paper would in the ordinary course of events have appeared in the April issue, but was held over as that issue was a special tuberculosis number.

Travancore by Iyengar, in Saidapet near Madras by Pandit *et al.*, and in Patnagarh by Rao.

In connection with field studies on filariasis it is necessary to differentiate between the occurrence of filarial infection. In an endemic area there are three classes of persons—those with filarial infection, those with filarial disease and those with neither filarial infection nor filarial disease. There is a certain amount of overlapping in the first two groups, those with filarial infection and those with filarial disease, because a small percentage of the population may have both filarial infection and filarial disease. The percentage incidence of persons with signs or

filarial disease, care being taken to ensure that those having both characteristics are not counted twice. Data for the calculation of the endemicity rates for different parts of India are not available except in a few isolated instances.

Another important void in our knowledge is in regard to the distribution of the two types of filarial infection in India, namely, *Filaria malayi* Brug, and *Wuchereria bancrofti* (Cobbold). The earlier records are not entirely reliable because any infection with microfilariæ was generally put down as *W. bancrofti*. The microfilaria of *F. malayi*, which was described from the Dutch East Indies ten years ago, has since been observed to occur in some parts of India. As



Map showing distribution of filariasis in India.

symptoms of filarial disease constitutes an adequate measure of filarial disease in the community. Similarly, the percentage incidence of persons with microfilariæ in their peripheral blood at night gives the filarial infection rate. Neither of these rates will, by itself, however, give an accurate idea of filarial endemicity in the locality. A proper measure of endemicity in any area as shown by Iyengar (1933a) should therefore be a combination of the two factors, the incidence of filarial infection and the incidence of filarial disease, both these factors being investigated simultaneously. The filarial endemicity rate is the number of persons in the community (expressed as a ratio per hundred) who exhibit either filarial infection or

far as we know at present *F. malayi* infection has been found to occur in a few isolated areas, such as Balasore (Korke, 1929), Patnagarh (Rao, 1936) and Travancore (Iyengar, 1932). It is possible that its distribution is much wider than what is known at present\*.

Apart from a purely academic interest, it is important to know the exact distributions of the two infections, as the measures of control are different in the two cases. This is because the transmitter of *W. bancrofti* infection is *Culex fatigans* while that of *F. malayi* is *Mansonioides*. These mosquitoes have different

\* A focus of *F. malayi* infection has also been found in Cachar.—EDITOR, I. M. G.

breeding habits and distribution and, consequently, the methods of control would necessarily be different. A proper identification of the microfilaria is therefore of considerable public-health importance.

### *Causation of filariasis*

The exact mechanism of the onset of filariasis is not yet clear but there can be no doubt that the condition is the consequence of an initial infection with *W. bancrofti* or *F. malayi*. The normal cycle of these infections is as follows: The infected person has microfilariae in the blood and serves to infect mosquitoes that may feed on him. Not all mosquitoes are capable of getting infected under natural conditions. The microfilariae of *F. malayi* develop best in *Mansonioides* and those of *W. bancrofti* in *C. fatigans*. In the mosquito host the microfilaria passes through its larval phases and reaches the final larval stage but there is no reproduction or increase in the number of filaria larvæ. The infected mosquito with full-grown filaria larvæ transmits the parasite when it bites man. In due course the recipient of the infection becomes a carrier and shows microfilariae in his peripheral blood. This carrier

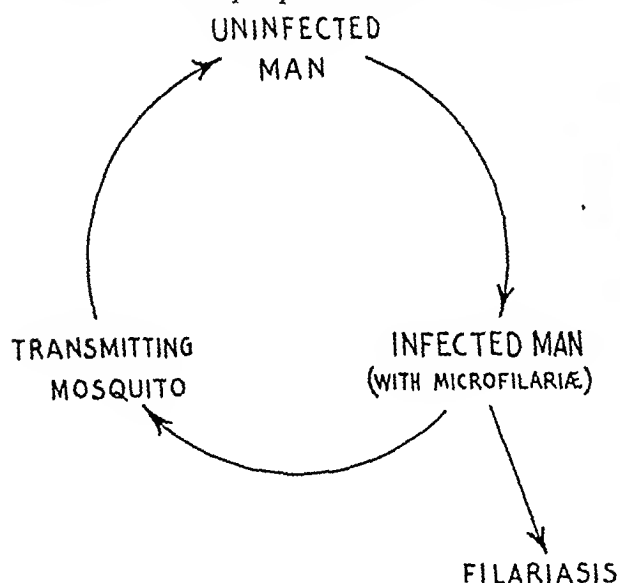


Fig. 1.

again infects the mosquito. This is the normal cycle of the infection (figure 1). As the parasite does not produce, by itself, any pathological conditions in the host under normal conditions, no signs or symptoms of filarial disease occur at any state in this cycle of infection. The onset of filarial disease appears to be the result of a complication setting in over a filarial infection and, in most cases, this complication is produced as a result of a superimposed infection by pyogenic organisms, though in some cases a hyper-infection may also produce the same result. The source of this bacterial invasion is usually some septic focus in the body as shown by Acton and Rao (1929). The initial stage

of the onset of the disease is characterized by lymphangitis which is followed by a more chronic condition, such as elephantiasis.

When the disease progresses the infected person tends to become 'negative' for microfilariae in the peripheral blood, either because of a lymphatic block or through the death of the worm. This appears to be the explanation for the large proportion of persons with filarial disease being 'negative' for microfilariae. Such persons do not play any further part in the transmission cycle. The onset of the disease is thus a tangential branching off from the normal cycle of infection. The complications resulting from the bacterial infection are inimical to the parasite as the microfilariae disappear from the blood after the onset of disease symptoms. They are also injurious to the host since they produce pathological conditions in him.

### *Incidence of filarial disease and of filarial infection in relation to age*

The data relating to an enquiry in certain endemic areas of Travancore have been analysed in order to bring out the incidence of filarial disease, filarial infection and filarial endemicity at different ages. The observations at Trivandrum were previously discussed by Iyengar (1933a). The incidences of filarial disease, filarial infection and filarial endemicity

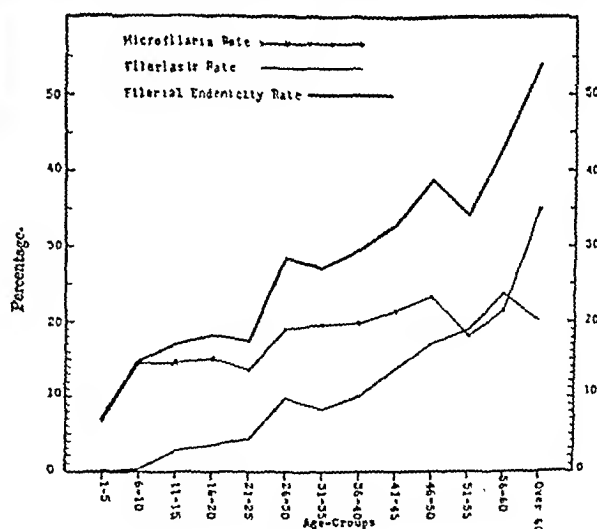


Fig. 2

in different quinquennial age groups are shown in figure 2. It may be seen that the infection rate is lowest in the first age group (1 to 5 years) and that in the next age group (6 to 10 years) it rises to 14.5 per cent. In the succeeding age groups the infection rate fluctuates between 18 and 23 and the mean trend is a feeble rise. The filarial disease rate is zero in the first age group and from the second group onwards it rises steadily in the later age groups.

While the filarial disease rate and the filarial endemicity rate show a progressive rise in the

increasing age groups, the filarial infection rate does not show any such marked rise except in the first two age groups. The reason for this difference in the behaviour of the filarial infection rate on the one hand and of the disease rate and the endemicity rate on the other lies in the fact that the onset of filarial disease is followed by the disappearance of microfilariae from the peripheral blood. Thus in the higher age groups, although the endemicity rate is steadily rising, the infection rate does not exhibit a proportional rise with progressive age because of the increase in the incidence of filarial disease and the consequent fall in the number of persons with microfilariae.

#### Relation of filarial disease to filarial infection

The absence of microfilariae in the peripheral blood of the majority of persons suffering from filarial disease and the fact that the majority of persons with filarial infection do not suffer from the disease militate against the acceptance of a causal connection between the parasite and filariasis in view of Koch's first postulate. However when we consider the geographical distribution of filarial disease and that of filarial infection in Travancore there is a remarkable coincidence. But this by itself may not constitute a convincing proof of their relationship. It was therefore considered necessary to examine the data statistically to find out if there was any significant correlation between the filarial infection rates and the filarial disease rates of the different areas investigated in Travancore. It was found that the correlation was positive and significant\*.

$$r = + 0.764 \pm 0.068.$$

#### Two types of filarial infections in India

As was mentioned previously we have two types of filarial infection in India, namely, *F. malayi* and *W. bancrofti*. The microfilariae of these two species can be differentiated on morphological characters. Although the relative distribution in India of the two species has not been worked out, the studies which I made in Travancore show that *W. bancrofti* infection is typically urban in distribution and that *F. malayi* infection occurs in rural areas (Iyengar, 1932). This is due to the fact that *W. bancrofti* infection is transmitted by *C. fatigans*, a mosquito most commonly observed in towns and only rarely in rural areas, while *F. malayi* infection is transmitted by the rural mosquito *Mansonioides*.

Both species are of pathological importance and are associated with filariasis in men. In *F. malayi* areas the chief manifestations are elephantiasis of the leg and hand; affections of the genitals, such as elephantiasis of the scrotum and hydrocele, are very rare. In *W. bancrofti*

areas, although affections of limbs are quite common, genital affections are also frequently observed.

#### Transmitter of *W. bancrofti* infection

The important transmitter of this infection, *C. fatigans*, is typically urban in distribution. The distribution of *W. bancrofti* endemicity is closely connected with the prevalence of *C. fatigans*. Areas with a high incidence of this mosquito have a high endemicity, while areas with a low incidence have a low endemicity. There is further proof of the relation between this mosquito and the occurrence of the infection in man, namely, that the infection rate among *C. fatigans* bears a close relationship to the infection rate in the human population. In Trivandrum which has endemic *W. bancrofti* infection, the infection rates observed in *C. fatigans* collected in 24 wards of the town show a significant positive correlation with the infection rate in the human population and the correlation coefficient is

$$r = + 0.5948 \pm 0.0888.$$

If we chart out the results, grouping the different wards into five groups according to

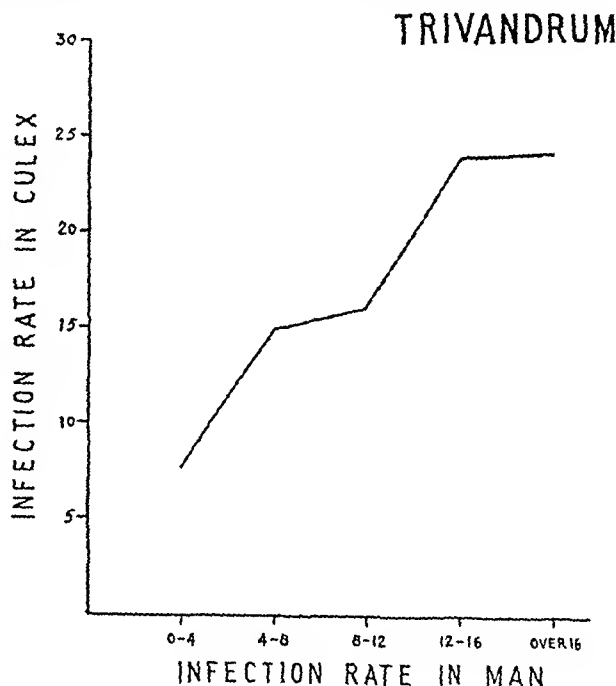


Fig. 3.

their filarial infection rates, we observe that the infection rate in the mosquito rises in direct proportion to the incidence of filarial infection in man (figure 3). The results show how the infection rate in the intermediate host, the mosquito, varies directly as the incidence of carriers among the human population and *vice versa*.

#### Areas with *W. bancrofti* infection

As already pointed out this infection is restricted chiefly to urban areas with great

\* I am indebted to Dr. Raja for working out this correlation.



density of population. An explanation for it may be the fact that *Culex fatigans*, which is responsible for the transmission of the parasite,

finally discharge it into some natural depression, often inside the town itself. There is no provision for the proper treatment and disposal of

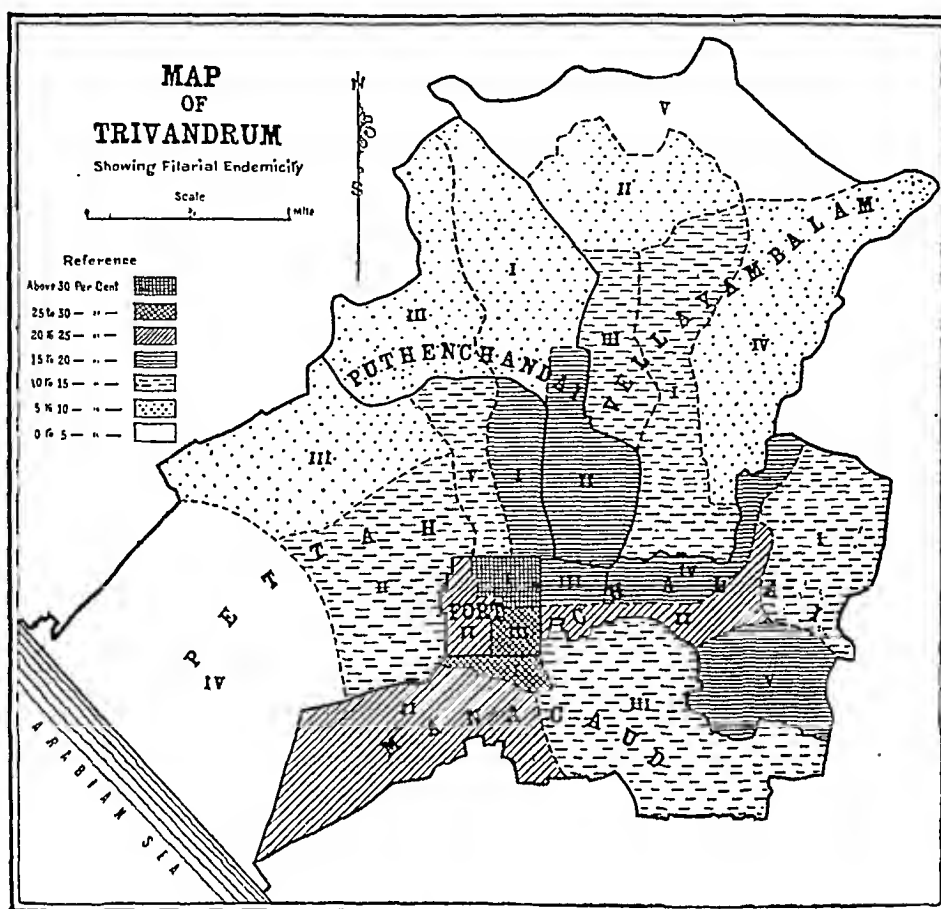


Fig. 4.

breeds in dirty water as, for example, sullage, and that, therefore, urban conditions afford more favourable opportunities for its multiplication than sparsely-populated rural areas. Even within a town, the incidence of this infection is, in consequence, higher in the central congested areas than in the outlying parts with a lower density of population. The distribution of filarial endemicity in Trivandrum is a clear example of this phenomenon (figure 4). There are various other factors that influence the endemicity of *W. bancrofti* infection as, for example, the lack of an efficient system of drainage, the level of the subsoil water and the nature of the soil. Climatic factors also have a bearing on the question inasmuch as a high atmospheric humidity and a certain range of temperature offer, as demonstrated by Rao and Iyengar (1930), the optimum conditions for the transmission of the infection. The extent of time during which such conditions prevail in a locality during the course of the year appears to influence the degree of its endemicity.

The common system of open masonry drains in Indian towns (*vide* figure 5) often does more harm than good. These drains merely collect the sullage from some parts of the town and

the sullage. In the absence of masonry drains the soil has a beneficial action on the sullage in that percolation of water freely takes place and, through the action of the soil bacteria, a clarification of the sullage is brought about. In consequence the conditions become less favourable for the breeding of *C. fatigans* than when crude sullage is left exposed in open masonry drains. In some urban areas every house has a masonry cess-pit in which sullage collects and is removed only at intervals. These pits help towards a prolific breeding of *C. fatigans*.

It is essential that a drainage scheme for the sullage of towns should be complete and should include its adequate treatment at the outfall. Imperfectly devised methods of land treatment of the effluent lead to waterlogging and provide excellent conditions for the breeding of *C. fatigans*. There is necessity therefore for rendering the drainage system proof against mosquito breeding at every stage.

The method for the control of the infection is by the control of the transmitter, *C. fatigans*. The most effective way of doing this is a proper system of subsoil drainage, but this is not feasible in all places in view of the cost. In the absence of such a system, temporary

measures for control will have to be carried out and these consist of the treatment with larvicides of all sullage drains, ponds and depressions holding dirty water.

One of the drawbacks in regard to schemes for the control of filariasis is that it is impossible to demonstrate any appreciable reduction in the incidence of the disease or of the infection within a short period of time. Local authorities who are responsible for providing the funds for such schemes are, on the other hand, likely to demand quick results. The minimum period necessary for achieving an adequate reduction in the incidence is at least ten years, mainly because the measures serve only to protect the new-comers and the uninfected persons in the population and have no influence on the persons who are already infected or those who have already developed the disease. Such persons will have to run through their normal course of the infection or of the disease. The only indication of beneficial results within short periods of time will be a reduction in the incidence of mosquitoes.

#### Transmitter of *F. malayi* infection

The important transmitter of *F. malayi* infection in India is *Mansonioides*. We have in India four species of *Mansonioides*, namely, *M. annulifera*, *M. uniformis*, *M. indiana* and *M. longipalpis*. The first-mentioned three species have been found by me to be infected with filariae in nature. Perhaps the most important of these species is *Mansonioides annulifera* which often occurs in very large numbers.

*Mansonioides* has a life history entirely different from most other mosquitoes. The female mosquito lays its eggs not on the surface of water but fixes them in clusters on the under

surface of the leaves of the water plant *Pistia stratiotes*. In nature, eggs are found only on the leaves of *Pistia* (Iyengar, 1933b). The presence of *Pistia* is an essential factor for the oviposition of *Mansonioides*. It is dependent on *Pistia* for yet another reason. Its larva unlike

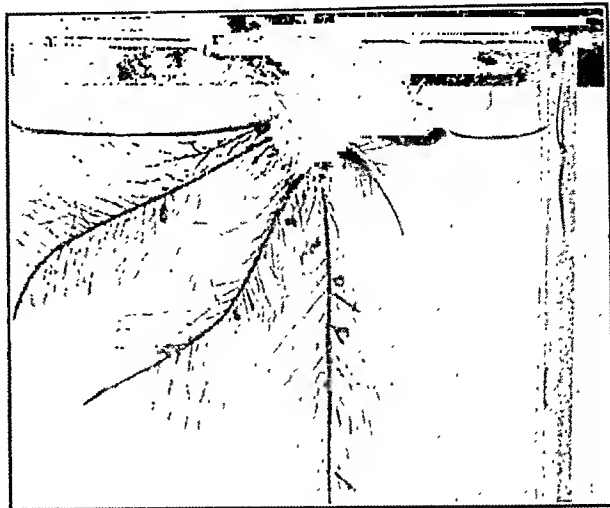


Fig. 6.—Roots of *Pistia* with *Mansonioides* larvæ attached.

those of other mosquitoes does not come to the surface of the water to breathe but stays below the water surface attached to the roots of *Pistia* and obtains its oxygen from the air cavities of the root (vide figure 6). This it does by piercing the root tissue by means of a modified breathing siphon provided with strongly-chitinized structures at its tip adapted for the purpose of piercing the root tissue. *Pistia* appears to be the plant best suited for the *Mansonioides* larva and the only one which is utilized by it. When *Pistia* plants are removed from a breeding place, the larvæ die away rapidly and disappear from the breeding place, although other water plants may be present in the pond. The pupa of *Mansonioides* is also adapted for obtaining its oxygen from the root of *Pistia* and its breathing horns are strongly chitinized for piercing the root tissue.

Another factor that facilitates the breeding of *Mansonioides* is the presence of suspended organic matter in the water. The larva of *Mansonioides* leads a sedentary life fixed to the root of *Pistia* and it therefore depends for its food on organic matter in suspension. In the absence of such suspended organic matter the larva fails to develop (Iyengar, 1935). The organic contamination that provides this food factor in Travancore has been found to be the rotting coco-nut husk which is steeped in ponds for the manufacture of coir.

Where these factors do not occur, *Mansonioides* fails to breed and consequently the incidence of this mosquito is low. These factors therefore play a large part in determining the endemicity of *F. malayi* infection. The influence

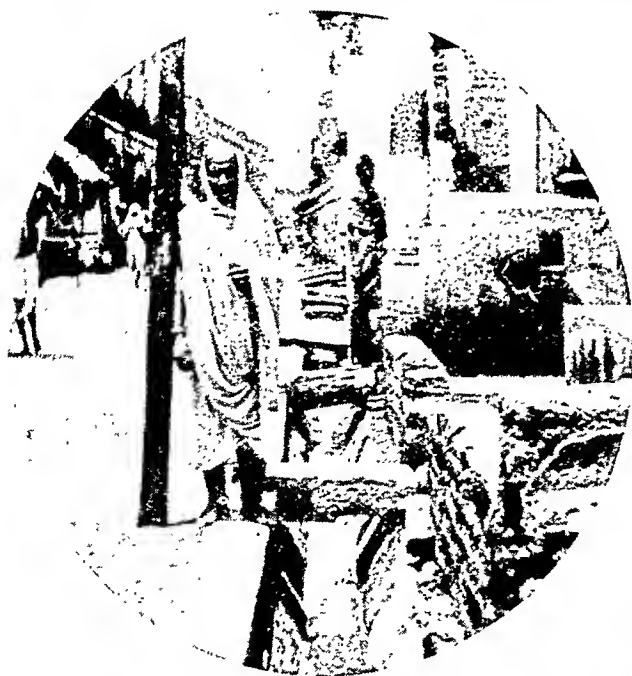


Fig. 5.—Masonry drains in Indian towns breeding *Culex fatigans*.

of these factors in controlling endemicity can be cited here.

The presence of ponds is a factor in determining the incidence of *Mansonioides*. The larger the number of ponds, the greater would be the facilities offered for *Mansonioides* breeding. In a flat area as in Shertalai or the flat areas of Vaikam and Paroor, the number of ponds is large while undulating areas have very few ponds. This would explain the low endemicity in the undulating parts of Vaikam and Paroor taluks in contrast to the flat areas in those taluks where the endemicity is very high.

At the centre of towns situated in endemic *F. malayi* areas, as for example Alleppey, we observe that the central areas have a lower *F. malayi* infection than the outlying wards of the town and the rural areas outside the town. This may perhaps be explained as being due to a proportional reduction in the number of ponds with the increasing density of population. This is contrary to what has been observed in regard to *W. bancrofti* infection, where it was found that the infection rate increases towards the centre of towns; while *F. malayi* infection increases in a centrifugal manner towards the periphery of towns. As has already been explained *Mansonioides* breeds profusely under rural or semi-rural conditions and *C. fatigans* under urban conditions.

Endemicity of *F. malayi* infection is also determined by factors which control the presence of *Pistia*. In an area where ponds are connected with tidal channels, the movement of the water and the introduction of brackish or saline water into the pond have an adverse effect on the *Pistia* since it does not flourish in moving water or in water with much salt in solution. This would explain why areas subject to tidal influence although close to endemic zones are practically free from *F. malayi* infection. Another factor that controls the incidence of *Pistia* is flooding. In areas subject to extensive flooding during the wet season as, for example, parts of Ambalapuzha and Vaikam, all ponds and depressions are covered with the flood water and the *Pistia* in the ponds is washed away. When the floods subside, although there may be extensive breeding of mosquitoes, there is practically no breeding of *Mansonioides*. This would explain why flooded areas in Ambalapuzha, Vaikam and Paroor are comparatively free from *F. malayi* infection.

As *Mansonioides* is the only important transmitter of *F. malayi* infection, it would indicate that measures for the control of the infection should be directed against the principal vector, *Mansonioides*. The method of controlling a particular mosquito, omitting all others which are not of importance, is known as 'species sanitation'. *Mansonioides* being entirely dependent on the presence of *Pistia* for its propagation and for the growth of its larval

stages, it is possible to effect this 'species sanitation' by biological methods, namely, by removing the plant which acts as the host for

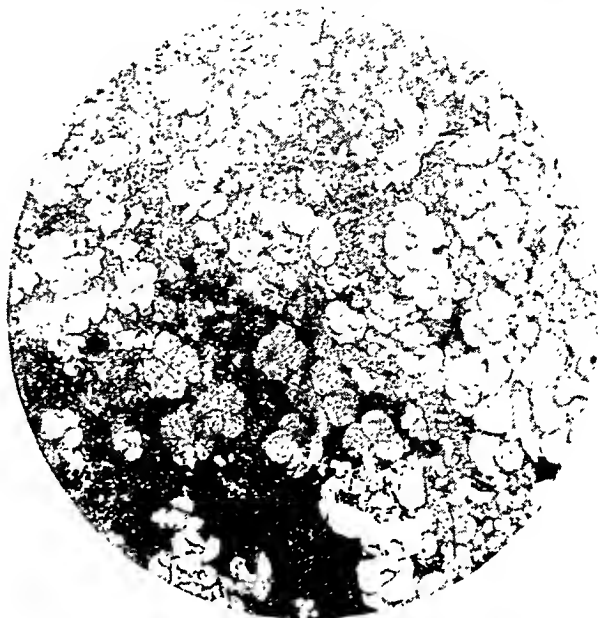


Fig. 7.—Pond with *Pistia* breeding *Mansonioides*.

the larvæ of this mosquito and which is essential for the growth of the larvæ (*vide* figure 7, a typical breeding place with *Pistia*).

An experimental scheme for the control of *F. malayi* based on this principle was started in a highly-endemic area in Shertalai taluk over an area of 25 square miles. The measures consisted in the removal of *Pistia* from all ponds and depressions in the area, but no attempts were made to remove the other water plants in the ponds. As a result of the removal of *Pistia* plants in the area, the incidence of *Mansonioides* in the area of operations was reduced to a very low figure, in striking contrast to the incidence of *Mansonioides* in the area outside this zone which served as control. Although there were quite a large number of mosquitoes (other than *Mansonioides*) in the area of operation, none of them showed infection with filaria larvæ which would indicate that, as a result of these measures, the transmission of the infection has been entirely stopped. On the other hand, in the control area a large number of *Mansonioides* was observed and a large proportion of these was found infected with filariæ which indicated that transmission of the infection was in progress in the control area.

#### Conclusion

The present position in India is that we have not the accurate data on filarial endemicity in different parts of India to enable us to compare conditions in one area with those of another. Filariasis is a widespread disease in India and, although cases of death due to filariasis are rare, the extent of incapacitation and

(Continued at foot of opposite page)

## THE ANOPHELES SUNDAICUS INVASION OF LOWER BENGAL\*

By R. SENIOR WHITE, F.R.S.E., F.R.E.S.

Malariologist, B. N. Railway

UNDER its former name of *Anopheles ludlowi* this mosquito was first recorded from Bengal

\* A paper read at the Public Health Society, Calcutta, on the 22nd March, 1937.

(Continued from previous page)

of sickness due to it is very large. No one seems to have ever attempted to estimate the number of persons suffering from filariasis in India.

The respective distribution in India of the two filaria infections, *Filaria malayi* and *Wuchereria bancrofti*, has not been adequately surveyed. This information is of considerable public-health importance because measures for the control and prevention of the disease to be undertaken in *F. malayi* areas are entirely different from those to be employed in *W. bancrofti* areas. The control of the spread of *F. malayi* infection through the clearing of *Pistia* from ponds and other water collections carried out in Shertalai taluk mentioned previously has been successful and should commend itself to other areas with similar conditions. This type of control work is perhaps the first of its kind.

The position in regard to the control of filariasis in India is very disappointing. There is very little work done in India on the control of this disease which maims a large number of persons and causes considerable suffering. While it is nearly impossible to cure filariasis, it should be easy to control the spread of the disease through suitable measures, especially as the disease is restricted to comparatively small areas.

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by James and Liston, from specimens collected at Frasergung, Matla and Konkondigee in the Sunderbans by Jenkins in November 1909, and from Port Canning itself by Gravely in December 1910.

These places are remote from Calcutta, only Port Canning is in direct communication with the city. The Sunderbans have always been notorious for their malaria, and apparently the findings were regarded as of no more than purely scientific interest.

A rude shock was given to this attitude by a virulent epidemic of malaria that broke out in the autumn of 1930 in the jute mill areas of Budge Budge and Chengail, situated on the left and right banks of the Hooghly, no more than 16 miles below the city. This epidemic was investigated by Iyengar, who found the causative species to be *A. ludlowi*, with at the time a sporozoite rate of 20 per cent. Spleen rates were up to 90 per cent in an area that had previously been found healthy ten years earlier in a survey by Khambhata.

This outbreak focused administrative attention on this insect, and the staff of the Department of Public Health, Bengal, was strengthened by one (ultimately three) survey unit to trace out the real distribution of the species in Bengal, and to record any further advances. A standing committee was formed, of which the writer is a member, and it is from the periodical survey reports of these units submitted to the committee that all later information in this paper has been collected.

The first fact elicited by the newly-appointed survey units in June 1931 was the discovery of heavy breeding at Falta, 25 miles from Calcutta, and connected thereto by a line of railway. The same month yielded the first instance of boat transport into the city. It was therefore decided to search trains at the various termini, and it was found that the K. F. Railway rakes stabled overnight at Falta (where there was now a severe epidemic) were bringing adult *ludlowi* to Majerhat terminus in large numbers, 7 per cent of them being infected. Searches at Sealdah in trains from Canning (where there was also an unprecedented malaria incidence) and Budge Budge, at Shambazar in trains from Hasnabad, and of the B. N. Railway local trains at Howrah all produced *ludlowi* by the end of September. This last finding led to the discovery of an unsuspected new breeding area at Uluberia, 20 miles out, where the train in question was stabled overnight. The initiation of this focus was traced to a country boat that had put into Uluberia from the Sunderbans.

These data at once led to suspicion that the Salt Lakes and the Majerhat swamps, outside the city, would become infested. It was experimentally proved that *ludlowi* could successfully breed out in both, but in spite of importation no natural breeding was discovered.

In February 1932, the Assistant Director, Malaria Survey of India, Col. Covell, examined the malaria situation in Calcutta city, and produced a report stressing the dangers of the situation.

During the winter of 1931-32 the Uluberia focus apparently became extinct, and breeding foci were no nearer to Calcutta than the original points of Chengail and Budge Budge, and Ghutiari Sharif, 19 miles out on the Canning line, but the following year registered another slow advance, which culminated in a 'cold-weather leap', breeding being discovered close to the city, on the western shore of the Salt Lakes, in December 1932. These cold-weather leaps appear to be related to the autumnal maximal breeding incidence just previously. It is seldom that science has an opportunity of studying an extension of its geographical range by any animal, which makes the present study not only one of great interest to the malariologist, but to the student of general zoology also. Discussing it with me shortly before he retired from this country, Sir Rickard Christophers said that he imagined that all species of animals, at their geographical boundaries, underwent a kind of peristalsis. The autumnal extension, and apparent winter recessions, of the *ludlowi* area certainly suggests this. Not only is Bengal the western limit of the species, it is also the northern, and here we can study an attempt by a purely tropical insect inhabiting a perennially equable littoral climate to colonize the subtropics with their much more definite seasonal changes.

The actual arrival of *ludlowi* on the city boundaries was an interesting phenomenon. *A. ludlowi* is a good traveller, as the railway records previously quoted have shown. But it is even fonder of boat than of train travel. The country-boat traffic of the delta approaches Calcutta by the following routes:—

(i) From down the Hooghly as far as the Sunderbans. These boats may pass through the city to points north of it, or may terminate at industrial points south of it, or unload in the docks and other localities within the city itself.

(ii) From the Matla river *via* the Bidyadhari river into the canal which circles the Salt Lakes (now too shallow for navigation) and divides into several branches within the city.

(iii) From Eastern Bengal generally *via* the Ichhamati river and the Bangor *khal* to join route (ii) at the south-east corner of the Salt Lakes.

Boats on routes (ii) and (iii) can pass out into the Hooghly to reach points north of the city through Chitpore lock. Boat traffic is of great density. Lines of boats extending over half a mile may accumulate and lie up at toll points, etc. The boats are covered country boats, often loaded many feet high with straw,

and afford ideal resting places to adult mosquitoes. In addition breeding of *ludlowi* in the bilge water is suspected, though I am not aware whether it has been actually proved. The boats are practically all owned by individuals, and their movements are subjected to no sort of control or regularity. Any attempt, however, to enforce legislation on the traffic would, it is believed, result in an increase in food prices in the city.

The journey of *ludlowi* to the city boundaries, that resulted in establishment of breeding within it, was accomplished by boat and not by train. The public-health department map, with its findings dated, shows that breeding was first found on the eastern shore of the lake, along which lies the line of the canal, and then, shortly after, at the point on the west where the canal enters the city. This dated set of findings conclusively proves that entrance was affected by circling the lake on three sides, and not to the western shore direct, as would have been the case if rail transport, by either the E. B. or B. N. Railways, had been the means. The insect, which had first been found (as adults) in the Kidderpore Dock area in November 1931, was again found in September-October 1932, and a search of the lock register clearly pointed to Falta as the importing source.

In the cold weather of 1932-33 *ludlowi* continued to spread on the western shore of the lake, and by February was breeding actually within Corporation limits. Transmission did not occur, naturally, until the rains, but in the third week of July 1933 there was a malaria outbreak in ward XXVIII (Beliaghatta). A mosquito infection rate of 6.6 per cent was accompanied by a human parasite rate of 59 per cent, and a child spleen rate which had been nil when taken in February was 9 per cent by July.

At the same time *ludlowi* was extending its footing on the right bank of the river around Chengail. The Uluberia focus, that had apparently died out in the winter of 1931, not only reappeared in November 1932, but by August 1933 had extended itself citywards for 5 miles to Bauria, accompanied by a sharp rise of malaria throughout this area.

The third cold weather again exhibited the '*ludlowi* leap'. First Belur, near the E. I. Railway workshops, 5 miles north of Howrah, was found infested in November, and before the close of the year infestation had been found on the edge of the French territory at Chandernagore, whilst a focus on the opposite bank at Shamnagar recrudesced after three years' apparent quiescence, actual breeding being found, which had not been the case in 1930. This instance, and that of Uluberia, suggests that though a focus once established may appear to become extinct during the subsequent cold weather, it is actually only dormant, and



a position once gained is never, in military parlance, evacuated.

The complete occupation of the deltaic area east of the Hooghly was apparently completed in 1934 and 1935. A focus at Godakhali, midway between Falta and Budge Budge, occupation of K. F. Railway borrow-pits up to Bishnupur, 8 miles south of Majerhat, and at several points along Tolly's Nullah were discovered. The Salt Lakes area was widely infested, whilst a vast stretch of country north-east of Canning stretching past Hasnabad to Swarupnagar on the Ichhamati was all found to be in *ludlowi* occupation. It is not certain whether this was only affected in 1934, for this tract had not been examined previously. We can have nothing but admiration for the work of the public-health department's survey units, but it is manifestly impossible for so small a personnel to examine the whole delta annually, hence foci discovered in later years may have existed earlier. Equally, it must be admitted, inability to examine all known foci each year may have failed to detect the evacuation of certain spots, though, as shown above, this I consider to be an unlikely occurrence.

The year 1935 completed the occupation of the Salt Lakes, even to central villages remote from the canal lines, 77 breeding places in this area being known by February 1936 as against 32 in the previous November, and of a group of villages on the Lakshmikantapur branch of the E. B. Railway. The number of breeding places actually within Corporation limits increased from three in March 1934 to 36 in March 1935. Dum Dum and Cossipore were found infested in April. These were undoubtedly new points. Ichapur Gun Factory was found infested in July. Diamond Harbour was also infested. In 1936 the most notable new breeding ground discovered was at Dakhuria, Ballyganj ward of the city being infiltrated by the adults produced. 1934 and 1935 were years of generally light malaria incidence in western Bengal, and the 1933 outbreak in eastern Calcutta was not repeated. But 1936, a year of general heavy incidence, especially on the western coast of the Bay of Bengal, produced a bad autumnal outbreak in eastern Calcutta. A sporozoite rate of 7 per cent in the mosquito brought spleen rates up to 52 per cent in Dhappa and 44 per cent in Pagladanga within Corporation limits. Transmission was actually occurring right up to the rather delayed onset of the cold weather in December.

Such is the story, up to date, of the *ludlowi* invasion of Lower Bengal. Throughout it has exhibited one significant phenomenon, the increasing adaptability to lower and lower salinities shown by the insect. Rodenwaldt and Essed give 12 to 18 per thousand as the most favourable concentration (pure sea water is 33 to 36 per thousand). Iyengar found the optimum at Budge Budge in 1931 to be 1.5 to 2.5 per

thousand, and even lower findings have since been recorded. At such values practically all the standing water around Calcutta would appear suitable, as regards salinity, for breeding. Neogi has, in fact, found it fourteen times in salinity of 0.1 per cent, with an optimum at 0.3 to 0.4 per cent. His upper limit of 27 per thousand closely agrees with similar Dutch findings of 30 per thousand.

Having recorded the facts, it is certainly open to us to speculate regarding their causation.

Covell suggests that in the years prior to 1930 there had been extensive clearance of the mangrove in the Sunderbans leading to increased breeding in the original focus. Enquiry from the forest department should enable this suggestion to be tested. It is certainly a fruitful one, it being well known how clearly *ludlowi* outbreaks in Malaya and the Dutch East are correlated with cutting down and bunding in formerly virgin mangrove areas.

Secondly, the progressive deterioration of tidal influence in the Salt Lakes, caused by the slow death of the Bidyadhari river, wants detailed tabulation from the mass of information that must be available in the records of the irrigation and public health engineer's departments, and also the Corporation. The seasonal salinity maps of the Bay of Bengal by Sewell show the following salinities at the head of the Bay :—

March—May	..	32	per thousand
June—August	..	30	" "
September—November	..	20	" "
December—February	..	30	" "

The season of the highest tides, which will penetrate further inland, is May—the period of maximum salinity—but even that is little above the maximum previously given for *ludlowi* breeding. Diluted as the farthest-flung tidal waters must be, the high tides of May-June can have little or no inhibitory effect on breeding. In the period of maximal breeding—the autumn—it is seen that *ludlowi* could comfortably (as regards salinity) breed in the sea itself far from land !

As regards changes in salinity in the Salt Lakes due to the gradual failure of tidal influence through the death of the Bidyadhari, averaging by years a table published by Neogi (though the points where analyses were made are not constant for the three years tabulated), we find, for points between Lansdowne Jute Mill and Bhamanghata lock as under :—

Year	Number of observations	Average salinity, per thousand
1926	4	17.31
1928	8	11.37
1935	6	0.51

Tidal influence therefore failed entirely between 1928 and 1935, i.e., in the years in which the *ludlowi* invasion of Bengal was accomplished.



The death of the Bidyadhari has been brought about by silting due to :

- (i) Bunds for fish culture.
- (ii) Bund reclamation for paddy cultivation.
- (iii) Calcutta's sewage outfall.

The rendering of the area from Matla to Calcutta suitable for *ludlowi* is therefore apparently an entirely man-caused phenomenon, and *ludlowi* malaria in this area is another case of 'man-made malaria'.

It is by no means to be assumed that this is so throughout the whole *ludlowi*-invaded area. I have read a good deal of the literature on the Hooghly, and cannot recall any recorded major changes in the last ten years between Chandernagore and Diamond Harbour, yet the left bank has been occupied by the insect from Shamnagar to Cossipore, and from Budge Budge to Diamond Harbour. The right bank, on the other hand, has only been occupied from Chandernagore to Belur, and for 5 miles above Uluberia. The deltaic area between the Hooghly and the Rupnarain, including the Damodar, is still free. Urban conditions in Calcutta and Howrah possibly prevent riparian infestation for some miles south of Cossipore and Belur, but why has the Budge Budge focus not spread northwards to Akra and Majerhat swamps? The latter were probably tidal before King George's Dock was built. Why have years of close watch on the Uluberia-Bauria focus revealed no attempt at extension west or east? Investigations on both sides of the insect's boundary at such points are most likely to yield the key to the inhibiting factors.

It is sometimes suggested that *ludlowi* had invaded Bengal before, and, having retreated then, may do so again. The evidence adduced for this is twofold. Brahmachari in 1912 recorded the insect as breeding in the Campbell Hospital tank from November to February of the previous cold weather. This tank is close to Sealdah station, to which the insect has probably been imported with some regularity from Canning for many years. The history of malaria in Canning in the autumn of 1911 may indicate whether *ludlowi* was unusually prevalent that year. In any case the occurrence is probably on a par with that in which *ludlowi* escaped from Sehüffner's laboratory in the Sumatran highlands and bred in the vicinity for several generations before it died out. It has not, even with heavy breeding within two miles at Dhappa in recent years, again established itself in the Campbell Hospital tank.

The second piece of evidence is the record, by Graveley, of *ludlowi* at Chingrighatta on the Salt Lakes in February 1915. This record appears to be rather uncertain. Covell states that Christophers received certain specimens from Annandale about that time thought to be *ludlowi*, but which he found to be only *subpictus*, and in his Calcutta report Covell makes no

reference to Graveley's record, which in any case does not state whether the specimens were bred or captured as adults. If the latter, it must be recollected that the Central Lake Channel was probably open to Chingrighatta lock as late as 1915, and so would be used by country boats from the Sunderbans.

To my mind, there is no hope of *ludlowi* naturally evacuating the tract it has occupied in the last six years, and without human interference this vast area may be said to have been lost to Bengal as developable territory.

As regards human interference, in discussing this one must unfortunately pass from the realm of scientific to that of political discussion.

The original focus at Budge Budge has throughout the period from 1930 been controlled by the public health department, working with funds augmented by the local municipality and the jute mills there, the area protected being limited to that affecting the town and the mills; the E. B. Railway malaria section co-operating as regards work in their own area.

The Chengail focus was at first dealt with by the public health department, with funds augmented by the B. N. Railway and two of the four jute mills, and the district board. Later, the protection of this area was handed over to the B. N. Railway medical department (malaria section) who were, and still are, controlling the extensions of this focus at Uluberia, Fuleshwar and Bauria without any external financial aid. In consequence, part of this focus, around Bauria cotton mill, is not dealt with as it does not affect the railway. This makes all the more interesting the failure of this focus to extend up-stream, previously referred to.

The original focus at Falta was dealt with by the public health department, with, I believe, some financial contribution from the K. F. Railway. But this focus, as the map shows, has steadily spread outwards.

At Canning work is done by the district and union boards and by the E. B. Railway, but this being an area where the insect has certainly been established for over a quarter of a century, if it is not within the natural range of the insect there can be no more hope of eradicating it than of any other endemic species.

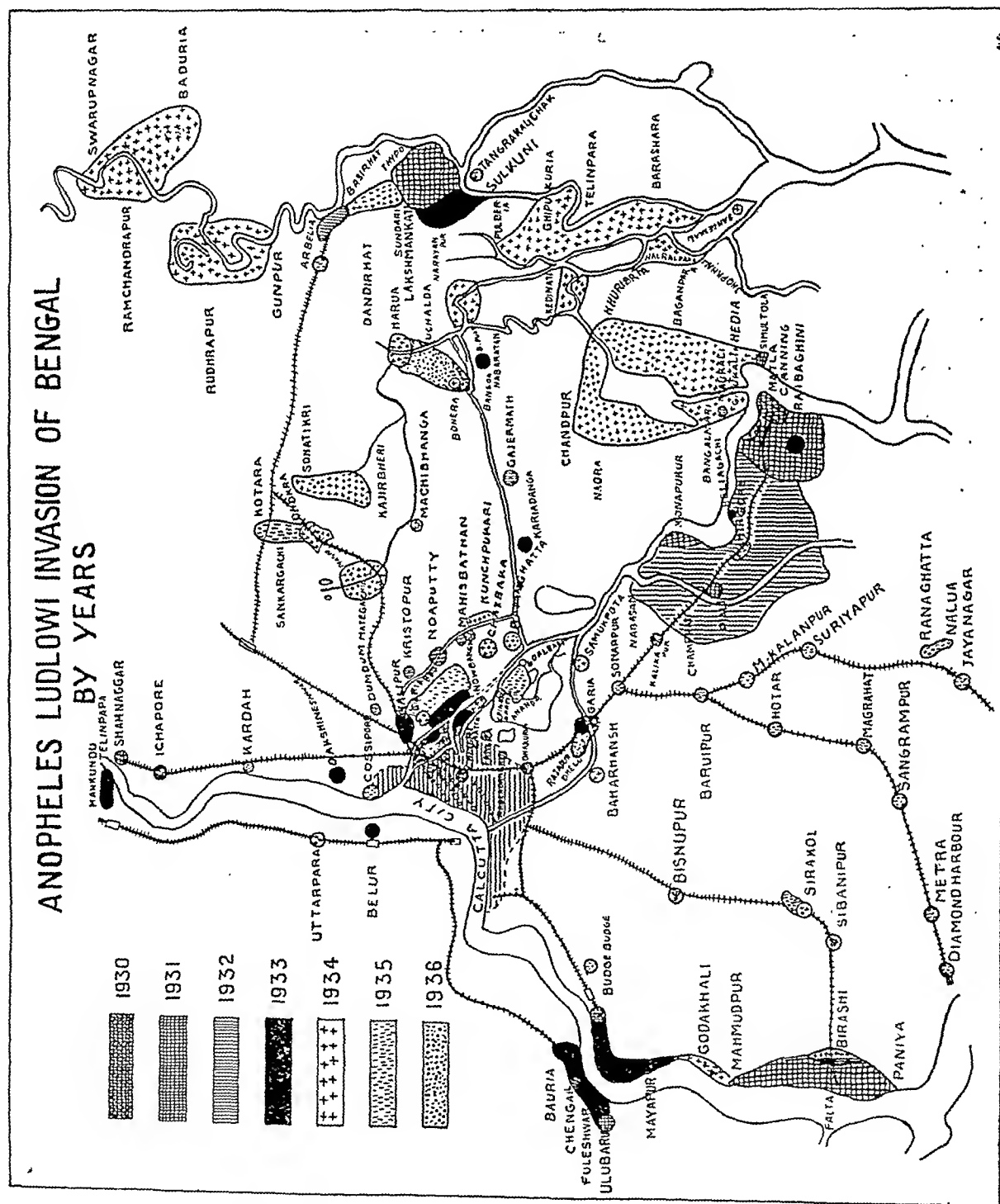
At Hasnabad the district board has made rather sporadic attempts at control. There being no major industrial interest there, results have been limited by financial considerations. At Behur the work has been from the start in the hands of the E. I. Railway medical department.

The story of the Salt Lakes focus is the most controversial. It is by far the most important, as it directly affects the city. The Corporation, though all along prepared to do work within their own boundary, have steadfastly pursued a policy of refusing to do anything one yard

beyond it. The district board, 24-Pergannas, is naturally financially quite powerless to do anything in and around the lakes. Thus Government struggled with the work unaided in that part of the lakes adjacent to the city, up till 1935, when they withdrew financial support from all active control measures and confined

last contributed to Government for work beyond their actual boundary.

As for the remainder of the invaded area shown on the map, it is rural, and no attempt has been made, nor is it financially possible to contemplate any attempt being made, to control these immense breeding areas by larvicides.



their efforts to survey work only. This left the lakes focus to increase unchecked, with results to the city in 1936 that have already been described. I understand that, following on the outbreak of last autumn, the Corporation has at

Are we then tamely to lie down to the permanent loss of these thousands of square miles? It is known that silty water is fatal to this mosquito. Repetitions of the very effective  
(Continued at foot of next page)

## FIRESIDE FANTASIES

By S. D. S. GREVAL

MAJOR, I.M.S.

## LIVING ON AIR

Do the feeders on *dal* and rice get their full requirements of nitrogen from their food? In India there are millions of people who do not touch meat, fowl, fish or eggs and are too poor to afford milk or milk products. Yet they live and work. Some of them work hard. Where would you find a hardier syce than the one in the United Provinces? The rice in their diet may give them an excess of carbon but the *dal* does not appear to provide anything like a sufficiency of protein (containing nitrogen). For days together they will dispense with it altogether and live on rice made acceptable with chilli paste. Does the *dal* provide them with the subtle nitrogen binding factor which enables the natural order of plants producing *dal* (*Leguminosæ*) to bind in their seed nitrogen of air?

One of these days I may confirm my presumption with calorimetry and the basal metabolic rate. The item will be entitled *Fixation of atmospheric nitrogen by animals on leguminous diet*.

## OPIMUM EATING

'He is seventy or two and seventy', I heard about a friend of my grandfather's, 'and yet he will thread a needle for you any day'. Glasses were then unknown. Fully ten years later I heard the same remarks about the same dear old grandpa. Age after 'seventy or two and seventy' stood stationary in the little village of K.K. in Ludhiana district of the Punjab. I do not know how long it had stood stationary before I heard the first pronouncement. The

(Continued from previous page)

North Budge Budge flood-flush scheme have been worked out by the engineering branch of the public health department for South Budge Budge and for the Chengail focus excluding Bauria. They await financial implementation. Such may one day be afforded, as the areas are industrial. But what of the Salt Lakes and the vast area east of the Ichhamati? Only a comprehensive irrigation and land reclamation policy, such as is advocated by the chief engineer of the public health department, can ever hold out any hope of eradicating, or even controlling, breeding. And in the way of such a policy, apart from finance, stands the serried ranks of vested interests in rice lands and fisheries that have so largely contributed to the spread of infestation.

I would plead for a commission of all departments of Government concerned—public health, irrigation, agricultural, and lands—to formulate a concerted scheme for legislation.

old gentleman had been a wrestler in the days of his youth. He had then worked hard as only a Punjabi farmer can work. His children and grandchildren had grown up and relieved him of his routine. Yet he would take the cattle out for grazing along the road or along the canal. Late in the afternoon he would take opium 'about the size of a mustard seed'. Perhaps at times he would take another dose later, if still up after the night had advanced 'a quarter' of the whole. He had done so for many years and would have probably done so for many more years had not a particularly vicious epidemic of plague claimed him.

'How long have you been here, Big Master?' I asked in my best Delhi accent of Urdu. 'For a century, Your Presence,' he replied in a melancholic strain. I had at last discovered in Rangoon in 1929 the grave of Bahadur Shah, the last of the Great Mughals. The Big Master had come with the Refuge of the World and the Emperor of Delhi to Burma in 1857. After the demise of the Emperor he had washed the grave stone, spread a cloth of silk and gold over it, and burnt incense near it. He would go on doing so as long as God gave him life and subsistence. The latter included a considerable amount of opium. His expression was indicative of contentment and benignity. His beard was long and hair longer. They were not snow white. Everybody who knew him had always seen him looking exactly as he looked then. A daughter of the Emperor, who was also traced, was, alas, not very communicative. She could have given a more precise figure for his age.

Grazing cattle are being looked after along the whole length of the Grand Trunk Road, as it passes through the Punjab, by old men who have retired from the Indian Army and are mostly 'seventy or two and seventy'. They have no literary inclinations, no diaries and no clear recollections of dates of births. Nearly all of them include opium in their daily ration.

Opium, taken in small quantities, after the retiring age, seems to keep off irritability, worry and the general wear and tear of the system. It is known definitely to prolong life in submarine disasters when the crew are entombed at the bottom of the sea with a very limited supply of oxygen.

One of these days I may confirm my presumption with the basal metabolic rate and reaction time. The item will be entitled *Reduction of catabolism and delay of dissolution under morphinism after retiring age*.

## TENDER TIPS

*Sag* for four months in the year, if not six, is the staple diet of us farmers in the Punjab. It consists of leaves, tender stalks and tips of the mustard plant, picked freely from one another's farms, cut up fine and cooked for several hours. Occasionally, and for a brief period only, the gram plant serves the same

purpose. The *sag* is eaten with maize or millet chapaties. Buttermilk goes well with this dish as it does with every other dish in the Punjab.

We do well. Our physique, stature, expectation of life and numerical strength in the army are the highest in India. We hold our own, outside India too, better than our neighbours, near or remote.

Other feeders on tender tips also do well. Amongst the mammals monkeys live on tips. Their energy is well known. Even their growth, after reaching the adult stage, particularly in the male, does not appear to stop definitely. Amongst the aquatic animals which live either directly on aquatic vegetation, which is all tender tips, or on other animals which live on aquatic vegetation, the growth definitely does not stop at all. No codified dimensions for any type of fish, for instance, can be quoted to silence an angler when he is telling the tale.

The aquatic vegetation is more than tender tips. It is the original living substance untamed by cages of wood hardened and reinforced with minerals from rocks of the earth. It is the substance which came into being as an embodiment of life, in the choicest of mixtures of colloidal solutions of nitrogenous matter accumulated at the bottom of collections of water (we will not call these accumulations silt). It learnt to live and grow and reproduce itself on the minerals of earth, flavoured with minerals occasionally falling on earth from celestial space as meteorites. It is still doing so. The land plants have on them only spots which could claim a remote relationship to the

independence enjoyed by the aquatic vegetation. These spots are on the tender tips.

Aquatic vegetation is being utilized for human consumption but not for the purpose we are considering. In Scotland it is served free of charge in public houses as *dulse*. In Japan it supplements not very plentiful food resources of the country as a breakfast dish. Diabetics and slimmers use it as agar jelly sweetened with saccharin to combat the emptiness of the alimentary system.

Recently, work has been reported on the initiation of growth by mitogenic rays emitted by growing points and meristems. Into a narrow glass tube, with one end sealed, is thrust a root from a growing onion. The tube is pointed horizontally at another root, from another onion, similarly enclosed in a narrow glass tube but disposed vertically. Both the roots are still integral parts of their respective onions. A branch grows on the vertical root at the spot pointed at. The essential feature of the procedure is the pointing of the tip of one root to an area on the other root. Dimensional disposition in space is immaterial. The growth-producing influence (mitogenic ray) passes through glass. It is not a vitamin. Is there a fairly stable substance responsible for the emission of the influence? Is it an element like radium? One of these days I may confirm my presumption. Upon the process I have not yet decided. The item will be entitled *Acceleration and initiation of anabolism by mitosisum*.

So much for the fireside fantasies. In Calcutta we keep fires in the winter just alight.

## Medical News

### PRESIDENTIAL ADDRESS DELIVERED BY MAJOR-GENERAL SIR CUTHBERT SPRAWSON AT THE SEVENTH SESSION OF THE MEDICAL COUNCIL OF INDIA, ON 12TH FEBRUARY, 1937

DR. YOUNG AND GENTLEMEN,

I welcome you here to-day to the seventh session of this council. Unfortunately since our last meeting we have lost one of our number by the death of Colonel Thorburn, a sitting member of the council. Colonel Thorburn had long experience of the frontier of India, in Afghanistan and in the Independent States of India, and he had but little more than a year ago been appointed to an office in the North-West Frontier Province well suited to his administrative abilities. We shall miss Colonel Thorburn from this council and in many other ways. You will presently be invited to express your sympathy with his widow.

We welcome back to the council Major-General Sir Frank Connor, now representing the Government of Madras, and we welcome a new member in Lieutenant-Colonel Dimond, the nominee of the Government of the North-West Frontier Province.

It is but three months since we last met; but there are a few matters of fresh interest and several items of former business, of the progress of which the council should be informed.

On the recommendation of this council the Governor-General in Council has notified the inclusion of the M.B., B.S. degree of the Rangoon University on the first schedule of the Indian Medical Council Act of 1933.

A proposal has been made to the General Medical Council for the recognition for registration of the medical degrees of the Universities of Calcutta, Rangoon and the Punjab approved by this council at their last session. This proposal will be considered by the executive committee of the General Medical Council at their meeting towards the end of the present month.

I explained at our last session the necessity of revising our Recommendations on Medical Education and informed you that the draft revised recommendations had been sent to the universities for their remarks. All the universities have now replied and their observations have been sent to you with the agenda for this meeting. The recommendations of the executive committee at their meeting yesterday have been laid on the table. I trust it will be possible for the council to consider those recommendations to-day.

As directed by the council at their last session the inspection of the Andhra University, including final examinations, has been carried out by our inspectors and the reports thereon were considered yesterday by the executive committee. The executive committee

decided to recommend to the council the further postponement of the recognition of the degrees of the Andhra University. The reports of the inspectors and the comments of the Andhra University thereon will be sent to members of the council so that the council may consider them with the executive committee's recommendation at a subsequent meeting.

A communication was received from the Andhra University suggesting a provision in the Act that a member representing a university should cease to be a member of the council, should he for any reason cease to be a member of the Faculty of Medicine of that university. Such a change would require an amendment of the Act and the proposal of the Andhra University is one of the points that should be considered later on if and when Government may undertake the revision of the Act. There are two other matters with which the executive committee have concerned themselves. One is about the teaching of obstetrics. The executive committee have addressed a questionnaire to all the universities asking information on several details of the practical instruction given in this subject. Their replies are awaited.

The other matter is the important one of the pre-medical scientific subjects. The executive committee consider that if these subjects were more efficiently taught by the science colleges, and taught also with a definite understanding that the student has a medical career in view, then it should be unnecessary for a medical college to teach them over again and to hold a pre-medical test examination. At our request the universities have furnished information about the courses of study and the examinations held by them for purposes of entry to their medical course, but we find the information insufficient and are addressing those examining bodies directly for further details of their syllabuses and the nature of their practical classes. We anticipate it will be necessary later to make an inspection of some of these courses.

Other inspections have also been the subject of your executive committee's consideration. We have now completed the first inspections of the courses of study and the final examinations of all the universities of British India that have medical faculties and it has been considered whether the time has now come to inspect not only the pre-medical scientific subjects already referred to, but also the medical scientific subjects, such as anatomy and physiology, and the instruction in these subjects, in greater detail. The executive committee yesterday decided that inspections of courses and examinations in the subjects of anatomy, physiology and pharmacology should be made during the present year and they have selected inspectors to that end.

A request was received from the Mysore Medical Council for the recognition under Section 13(1) of the Indian Medical Council Act, 1933, of the degree of M.B., B.S. of the University of Mysore. The executive committee decided to inform the Mysore Medical Council that a necessary preliminary to recognition by the Medical Council of India of this degree would be the inspection by our inspectors of the courses of study, examinations and facilities for teaching of the Mysore University and we enquired whether the university would be agreeable to such an inspection. In reply, the Mysore Medical Council have forwarded a copy of a letter from the registrar, Mysore University, to them, stating that the question of inviting inspection would be considered after the extension and improvements now in progress in the Medical College, Mysore, were completed.

The regulations proposed for this council will be before the present session. They have been the subject of long consideration both by Government and by this council and it is hoped that the present session will see them at last in finished form.

I referred at some length at our last session to our foreign relationships, particularly those with the Portuguese and French Indies.

It is satisfactory to know that the Portuguese Government have reintroduced the reciprocity

formerly existing between Portuguese India and some of our provinces. This means that medical men passed out by any of the universities of the presidencies of Bombay, Madras and Burma, or licensed by the College of Physicians and Surgeons of Bombay, or those passing degrees higher than the last-mentioned college obtained in the said Bombay Presidency, or even who have medical qualification of the schools of Burma equivalent to the course of the medical and surgical school of Nova Goa, can exercise their profession in this colony.

As regards French India the executive committee have decided to represent the case to the Governor of French India. Before doing so, they have asked for the view of the Provincial Medical Councils as to whether they wish to have reciprocity with French establishments in India, and, if so, on what conditions and also what action, if any, they propose in case the reciprocity is not agreed to by the French authorities. Replies are still awaited from most of the provincial medical councils. This matter will come before the council with the recommendations of the executive committee in due course.

I reported also to you at our last session that we had entered upon our duties under Section 13 of the Act and were in correspondence with the authorities in other countries, especially with those whose degrees are already on our Second Schedule. The negotiations have continued and though I do not intend at this moment to state the stage we have reached in regard to each country, I will review briefly the general position. The countries whose degrees are on our Second Schedule are other parts of the British Empire, and Italy and Japan. We have been in correspondence with the authorities of Ceylon, Hong Kong, the Straits Settlements, Malta, Newfoundland, New Zealand, South Africa, New South Wales, South Australia, Victoria, Alberta, Manitoba, the North-West Territories of Canada, Nova Scotia, Prince Edward Island and of Italy and Japan.

We have received no reply from Japan and with Italy our negotiations are delayed pending the conclusion of a new agreement. Hitherto only the holders of degrees on the British register have been entitled to recognition in Italy; but in future the accession of India to the new agreement is to be provided for separately on a basis of equal reciprocity between Italy and India. We can serve no useful purpose meanwhile by approaching any authority in Italy.

From the other countries I mentioned the replies, in cases where the correspondence has been completed, have been, as I indicated at our last session, usually on the lines that they will recognize only those of our degrees that have received the recognition of the General Medical Council. I wish you earnestly to consider this matter and its implications, because you will be required to give a decision thereon at our next meeting. Unless you specifically recommend to the Governor-General that degrees which are not on our Second Schedule should remain thereon they will automatically be removed after next October. If you allow the degrees of one of the countries I have mentioned who are prepared to recognize our approved qualifications only *via* the General Medical Council to be removed from our Schedules the position would arise that graduates of Indian universities would be recognized in that country, but their graduates would not be recognized in India. At your next meeting you should have before you the recommendations of the executive committee on this subject and a précis of the replies from the countries concerned.

Most of the countries not on our Second Schedule with whom we have corresponded have no degrees of their own or at least no qualifications generally recognized; but they are of interest to us because Indian practitioners sometimes go there. They are Kenya, Tanganyika, Uganda, Zanzibar, British Guiana, Mauritius, Fiji, Iraq and Iran. Where correspondence has been concluded the replies vary from an inability to recognize anything not recognized by the General Medical Council to an acceptance in one case,



Tanganyika, of the degrees included in our First Schedule and approved by this council. With both Iraq and Iran the position is different, but I should not detain you now to describe the peculiarities of these individual countries.

Our proceedings for the engagement of a new secretary to the council from next November have been the subject of correspondence with the Government of India, and this matter will come before you to-day as a separate item.

This is the last session of this council at which I shall have the honour to preside and the last occasion at which I shall have the opportunity of meeting many of the members of this council. It is a matter of great satisfaction to me that this council has been able to do so much directly and indirectly, in the ways that I described at our last session, towards the objects for which the council was established and I thank you for your cordial co-operation in the work we have performed. I thank more particularly the members of our executive committee who have given freely their time and experience to the benefit of the council, and especially I thank our Secretary, Colonel Burke, for the careful way he has always prepared the matter for our deliberations, and his office staff for their able assistance at all times.

My successor as President for the next year will be Major-General Bradfield, an officer known already to several among you and one who has already had experience of provincial medical councils in two of the presidencies of India. I feel assured that you will accord to him the support you have so generously given me and you too may rest assured that my concern in this council and its work will not cease with my resignation therefrom, but I shall always follow the council's proceedings with eager interest and will be ready to assist the council's just ends if opportunity allows me to do so.

I thank you all and wish you good-bye, and that the Medical Council of India may flourish and achieve its objects.

# REORGANIZATION OF INDIAN MEDICAL SERVICE COMPOSITION UNDER REFORMS

(From the *Statesman*, Friday, 26th March, 1937)

Delhi, 24th March.

THE *communiqué* dealing with the reorganization of the Indian Medical Service under the new Constitution has now been amplified.

'The main object of the scheme', it says, 'has been to reconcile, as far as possible, the natural and legitimate desire of the provinces to exercise complete autonomy in the field of medical and health administration and of ensuring that officers and families of the superior civil service have the standard type of medical attendance to which they are entitled.'

It adds that the fulfilment of two needs referred to above might in either case be held to derogate to some extent from complete autonomy of the provinces, but the provinces themselves cannot disclaim all interest in the requirements of defence forces, since the protection that they afford obviously extends to provinces as integral parts of India.

Nor can there be any constitutional objection to the maintenance of the civil branch of the I.M.S. on an all-India basis for the purpose of attendance on members of superior civil services and their families, seeing that it has been decided to maintain on the same basis the I.C.S. and Indian Police.

The attainment of the objects in view can be secured most efficiently and economically, from the view point of India as a whole, by continuing the existing medical services broadly on their present basis, and the possibility of unifying the military medical services in India, which have frequently been examined and as frequently rejected for practical reasons during the last 50 years, must be finally abandoned.

So long as the superior civil services in India contain a number of British officers and British personnel, it is not unreasonable that these officers and personnel, like Indian members of the services, should be provided with opportunities of securing medical attendance for themselves and their families from doctors belonging to their own race.

The acceptance of this principle involves continuation of British recruitment to the I.M.S. by the Secretary of State by whatever methods are calculated to produce the best recruits.

On the other hand, the extent of British recruitment should in future be based on the actual requirements indicated above and not on the predetermined ratio of British and Indian officers.

From the fact that large numbers of qualified Indian doctors in private practice are available in India, while there are very few British, it follows that the war reserve on which the Army is to rely for its increased requirements in war must be composed mainly of British officers.

The importance of maintaining a war reserve of Indian officers of the I.M.S. cannot be placed on quite the same plane of necessity, but it is desirable to have a small reserve of such officers in civil employ, who will possess military knowledge and training as a result of regular service in the Army.

If the result of these considerations is not to increase or even to decrease the present proportion of Indians in the I.M.S., it must be recognized that further Indianization of the medical service must be looked for, not so much within the I.M.S. itself as in provincial services by throwing open to the latter the appointments which are now reserved for the former.

There should be no compulsion, therefore, on the provinces to employ I.M.S. officers in excess of the small war reserve mentioned above, but it should be open to them to employ as many Indians as they wish of their own free choice, provided only that they will guarantee them sufficient security of tenure to avoid an embarrassing surplus being thrown back on the Army for absorption as a result of some sudden change of policy.

The extent to which the provinces of the future should be required to employ I.M.S. officers should be no more than are strictly required for these purposes, and the Government of India themselves should do what they can to reduce these numbers both by providing the fullest justifiable establishments for the Army in peace and also by contributing their legitimate quota to the war reserve from among I.M.S. officers under the central civil departments.

The circumstances in which the officers of the I.M.S. are employed by the Provincial Governments in future should be such as to give the provinces the greatest possible latitude of choice to encourage the officers chosen to identify themselves as closely as possible with the interests of the provinces which they are serving and to relieve the provinces as far as possible of the extra expenditure involved in employing officers on higher rates of pay than those which they find sufficient to attract recruits to their own medical services.

Subject to the observance of the foregoing requirements, the fullest possible use should be made of indigenous material in meeting the medical needs of the Army and the strictest care should be taken to safeguard the personal rights of all serving members of the I.M.S. and also to maintain the attractions of the service which possesses a distinguished record of past achievements to the benefit of India and of humanity at large, and which has contributed so largely to the medical and health administration of high standards of prescription and maintenance of high standards of the present I.M.S. cadre (actuals) is composed of 649 officers (386 British and 263 Indians).

Of these 386 British officers, 200 are in the military and 186 in the civil branch, respectively. Of the 263 Indian officers, 154 are in the military and 109 in the civil branch, respectively.

The composition anticipated after the reorganization of the I.M.S. cadre will be as follows: Total 584 officers



(386 British and 198 Indian). Of these 386 British officers, 220 will be in the military and 166 in the civil branch, respectively. Of the 198 Indian officers, 144 will be in the military and 54 in the civil branch, respectively.

The *communiqué* adds that, from what has already been said, it is obvious that the merits or demerits of the present scheme of reorganization must be judged not from any single point of view, but from a number of different angles.

The increase in the present authorized establishment of the officers on the Army side, although not restoring those establishments to the strength of those employed previous to the last retrenchment, will involve considerable increase of expenditure in the immediate future.

This additional expenditure will be further increased by the necessity of providing conditions for the existing members of the I.M.S. so as to maintain a proper balance between the attractions of that service and the Royal Army Medical Corps and by the acceptance of liability to pay the provinces a subsidy in respect of 77 British I.M.S. officers of the war reserve who will be employed by them.

On the other hand, the Government of India are satisfied that the reorganization will provide adequately for the requirements of the Army both in peace and war and also for those of the Crown representative, the civil departments of the Central Government and members of the superior civil services and their families.

Considerable savings will ultimately result both under the pay and pension charges in the Defence Budget.

It is estimated that the financial effect of the reorganization on the Defence Budget during the next few years, even after the separation of Burma has been taken into account, will be an increase of about Rs. 50,000 under effective pay charges and about Rs. 3½ lakhs by way of subsidy to the provinces in India, but that ultimately the cost of the larger number of officers to be employed will be several lakhs less than the present charges.

Although for a period the provinces will continue to employ and pay at the present rates a number of British and Indian I.M.S. officers who possess personal rights in addition to the 160 referred to above, those of them which employ war reserve officers will be relieved with effect from 1st April, 1937, of the average cost of overseas pay of 77 British officers who will constitute the statutory war reserve in the provinces.

The terms of cash relief will vary from about Rs. 65,000 yearly for the largest provinces down to about Rs. 15,000 yearly for the smallest.

The provisions by which the provinces will be authorized to exercise the maximum discretion with minimum intervention from the Central Government in initial selection, ultimate retention and interchange of officers to be employed, combined with provisions by which officers themselves will forego the right to revert to the Army after a suitable period of civil employment, will tend to promote that community of interest between the employer and the employed which is essential to the smooth and efficient working of all administrative arrangements.

#### *Short-service commissions*

An improved time scale of promotion and revised scales of pay for present incumbents combined with a re-adjustment of scales of basic and overseas pay for future entrants should provide for British and Indian officers alike inducements required to enable the service as a whole to compete successfully for recruits of good quality with what may be described as its principal rivals.

To a British officer, that is to say, the I.M.S. will provide attractions in many respects superior to those of the R.A.M.C. To an Indian officer it will offer better terms than any provincial medical service.

The method of entry by selection and nomination which has given good results in the past will be continued, but the introduction of short-service commissions for Indians on the model of the R.A.M.C. system should eliminate the criticism now directed against the

present system of granting temporary commissions for one year at a time up to a total of five years.

The resolution of the Government of India (Defence Department) with the approval of the Secretary of State contains changes that will be made in the organization, distribution and terms of service of military medical services in India (excluding Burma). Where necessary rules giving effect to these proposals will be made by the Secretary of State under Part X of the Government of India Act, 1935.

While recruitment for the I.M.S. will continue as at present to be conducted by nomination on recommendation of the Selection Board, the normal method of entry for Indian members of the service will follow the system adopted in the R.A.M.C. New entrants will be given short-service commissions for five years. The present temporary commissions renewable from year to year up to five years will be abolished, but the present holders of temporary commissions will be eligible for selection for the grant of short-service commissions and ultimately of permanent commissions on prescribed terms, that is to say, after a total of five years of service in a non-permanent capacity.

For a period of two years, from 1st April in order to give sufficient notice of change, the Secretary of State will reserve the right to appoint suitable Indian candidates permanently to the service without the preliminary of short-service commission.

#### *Special pensions*

While liability to serve either on military or civil side has for many years been a recognized condition of service in the I.M.S., it has been made clear since March 1931 that no new entrant to the service since that date can establish any claim to be transferred to civil employment.

Subject to the maintenance of these general conditions, the terms on which I.M.S. officers will be transferred to civil employment after 1st April will be revised.

The Director-General of the I.M.S. will endeavour to come to a working agreement with all civil employers under which the latter will intimate at periodical intervals their probable requirements for the next six months.

A suitable number of special pensions equal to a colonel's pension will be provided for award to selected officers (in civil employment) on the special supernumerary list in order to compensate for the loss of pensionary prospects that would otherwise be involved by ineligibility for promotion above the rank of a lieutenant-colonel.

#### *Reserved appointments*

Three appendices classify reserved I.M.S. appointments under the Central Government and Provincial Governments, as also rates of pay for present and future entrants.

The present basic pay of a lieutenant will be Rs. 500 plus an overseas pay of Rs. 150 per mensem and for a captain Rs. 650 up to a maximum of Rs. 850 plus an overseas pay of Rs. 150 and £30, respectively.

For a major a minimum of Rs. 950 plus £30 overseas and maximum Rs. 1,250 plus £30.

For a lieutenant-colonel Rs. 1,500 plus £30 and Rs. 1,600 plus £30.

For future entrants the basic pay for a lieutenant will be Rs. 450 plus £15, for a captain minimum Rs. 500 plus £25, maximum Rs. 700 plus £35, for a major Rs. 800 plus £35 and Rs. 1,100 plus £40 and for a lieutenant-colonel minimum Rs. 1,350 plus £40, maximum Rs. 1,500 plus £40.

### BOMBAY MEDICAL COUNCIL

The following extracts from a summary of the proceedings of the meeting of the Bombay Medical Council held on 1st February, 1937, are published for information:—

The council proceeded to consider the requests made by the representatives of newspapers and certain

visitors at the meetings of the council for the supply to them of the papers connected with the agenda and resolved that it is not practicable to furnish copies of such papers to the press or the visitors.

The council proceeded to consider further the application of Mr. G. S. Kasyapi, L.M. & S., for the restoration of his name to the Bombay Medical Register and resolved that sufficient time had not yet elapsed before his request could be entertained.

The council proceeded to consider the application of Mr. Shripad Narhar Kulkarni, M.A., B.S., for the restoration of his name to the Bombay Medical Register and resolved that his name be restored to the register.

The council proceeded to consider further the draft revised code of medical ethics and resolved (i) that it is not desirable to issue any binding rules or to insist on a rigid code which shall have the force of law but that full freedom should be retained to treat any case on its merits and (ii) that further elaboration of the ethical principles which should guide members of the profession is not necessary.

The council proceeded to consider further the reference from the Medical Council of India regarding the conditions of medical practice in the French Establishments in India affecting Indian Nationals possessing medical degrees included in the First Schedule to the Indian Medical Council Act, 1933, and resolved to endorse and agree with the resolution passed by the Madras Medical Council at their meeting held on 27th October, 1936, viz, that 'This (the Madras Medical Council) resolves to request the Medical Council of India immediately to recommend to the Government of India that registered medical practitioners in the provincial registers in this country may be allowed to practise in French India, and in case the French Government refuses to comply with this suggestion, that the Government of India may be requested by the Medical Council of India to enact suitable legislation to prevent practitioners from French India from practising in British India unless they are in the provincial registers'.

The council proceeded to consider the reference from the Medical Council of India regarding the conditions of medical practice in Portuguese India affecting Indian Nationals possessing medical degrees included in the First Schedule to the Indian Medical Council Act, 1933, and resolved (i) that no further action in the matter appears called for, as the reciprocity at present existing between the Government of Bombay and the Government of Portuguese India has been continued, but (ii) that the Medical Council of India should be informed that the Bombay Medical Council would urge that the Government of Portuguese India be requested to allow all medical practitioners registered under the Bombay Medical Act, VI of 1912, to practise in Portuguese India.

The council proceeded to consider the request of the Dean, the Nair Hospital Dental College, Bombay, for the council's support in bringing a Dentists' Registration Act on the Statute Book and resolved that the council would be prepared to assist in the preparation of a Dentists' Registration Act for Bombay, if a demand for such an Act is made by an organized dental profession.

The council proceeded to ballot for the election of an executive committee for the year and, in accordance with the result of the ballot, declared the following six members as duly elected:—

Dr. D. A. D'Monte, Dr. Rajabally V. Patel, Sir Mangaldas V. Mehta, Lieut.-Col. W. C. Spackman, I.M.S., Khan Bahadur Sir Nasarvanji Choksy, and Lieut.-Col. Sir Jamshedji N. Duggan.

The council proceeded to consider certain points raised by the registrar for orders in connection with the next general elections of members of the council, due to be held during the year, and resolved that—

(i) the existing practice of treating the Medical Register as the electoral roll under clause (1) of Rule 12 of the Rules of the Council be continued;

- (ii) all practitioners registered up to the 10th August, 1937, should be included in the electoral roll;
- (iii) 12th August, 1937, should be fixed as the date up to which nomination papers should be received in the council's office;
- (iv) 19th August, 1937, should be fixed as the date for the issue of voting papers;
- (v) 10th September, 1937, should be fixed as the latest date for the return of the voting papers and the counting of votes; and
- (vi) that the various instructions required to be published should be published in the *Bombay Government Gazette*, the *Times of India*, the *Bombay Samachar*, the *Daily Gazette*, Karachi, the *Kesari*, Poona, and the *Sind Official Gazette* and through all Medical Associations and societies on the list of the Office of the Council.

The council proceeded to consider a motion given notice of and made by Mr. R. A. Amesur and seconded by Dr. P. T. Patel and supported by Mr. M. N. Talati, proposing the amendment of Sections 2, 5 and 19 of the Bombay Medical Act, VI of 1912, and the motion was lost, a majority of the members voting against it.

The council proceeded to consider a motion by Mr. M. N. Talati, regarding the grant of fees and travelling allowance to the members for attending the meetings of the council and the committee, but the motion fell through for want of a seconder.

The present meeting being the last on which Major-General Bradfield had to preside in view of his impending departure to take up the appointment of his Director-General, Indian Medical Service, Sir Temulji Nariman then moved—

That the council place on record their appreciation of the cordial way in which General Bradfield had always conducted the meetings of the council and the great help he had rendered in the disposal of the business which came before them.

The motion was seconded by Sir Nasarvanji Choksy and on being put to the vote, was carried unanimously. After General Bradfield had made a suitable reply and thanked the members, the meeting terminated.

### THE TINNEVELLY DISTRICT MEDICAL ASSOCIATION, PALAMCOTTAH

(AFFILIATED TO THE INDIAN MEDICAL ASSOCIATION)

The Tinnevely District Medical Association held its monthly meeting on Saturday, 27th February, 1937.

In the morning a health exhibition was arranged at the Board High School, Nanguneri. The exhibition was opened by Lieut.-Col. T. S. Shastri, I.M.S., the president of the Association. The exhibition was kept open to the public till late in the evening. The exhibits consisted of posters relating to cholera, tuberculosis, malaria, smallpox, fly-disease, etc. About 300 school teachers and school mistresses of Nanguneri taluk attended the health exhibition which was held at the same place and along with the educational exhibition of the Elementary School Teachers' Conference. Leaflets on venereal diseases kindly supplied by the National Health Association of Southern India, Madras, were distributed to all of the teachers, mistresses, etc.

The monthly meeting of the association was held at 4-30 p.m. with tea and music on the Veena at the Traveller's Bungalow, Nanguneri, under the presidency of Lieut.-Col. T. S. Shastri, I.M.S. Thirty members of the association were present on the occasion. The following resolution regarding the demise of Diwan Bahadur Dr. C. Natesa Mudaliar, L.M. & S., was passed unanimously:—

'The Tinnevely District Medical Association places on record their sorrow at the demise of Diwan Bahadur Dr. C. Natesa Mudaliar, L.M. & S., M.L.C., one of the most prominent and respected members of our profession who did silent and loving service to the sick poor, and one of the most useful citizens of our Presidency, and conveyed to the bereaved family their heartfelt sympathy'.

The secretary and treasurer, Dr. K. Rama Ayyar, M.B.B.S. (Andhra), read the minutes of the Eighth

Anniversary of the Tinnevely District Medical Association, which were passed.

The following interesting specimen was shown to the members:—

By whom	Specimen
Lieut.-Col. T. S. Shastri, I.M.S.	Dermoid cyst (left ovary) with balls of hair.

The following interesting cases were demonstrated:—

By whom	Cases
Lieut.-Col. T. S. Shastri, I.M.S. Dr. M. Vaithianathan, L.M.P. Dr. G. S. Narayana Iyer, L.M.P.	Syphilitic gastritis Tuberculous peritonitis. Aphasia (chronic).

Dr. P. S. Srinivasan, L.M.P., sub-assistant surgeon of the Government Headquarters Hospital, Palamcottah, read out the following interesting cases:—

(a) Myxœdema and cretinism (in one and the same family), (b) strangulated hernia with a tumour on the pelvic colon, (c) syphilitic gastritis, and (d) an early case of mycetoma of the foot. Dr. M. Vaithianathan of Nanguneri read the clinical notes of a case of tuberculous peritonitis. Dr. G. S. Narayana Iyer read out his notes of the case of aphasia.

After detailed discussion by the members, Lieut.-Col. T. S. Shastri, I.M.S., summed up the salient and important features of all the cases. He offered his cordial thanks to all those members who helped towards the success of the function and thanked Dr. M. Vaithianathan for the excellent arrangements.

### HUNTERIAN SOCIETY

#### GOLD MEDAL FOR PRACTITIONERS

ANY registered general practitioner resident within the British Empire is eligible to compete, and the medal, which is of gold, is awarded annually to the writer of the best essay on a subject selected by the Society.

Competitors—men or women—must be engaged in general practice and essays should be sent in by 31st December.

The essay must be unpublished and original, and be based on the candidate's own observation, but it may contain excerpts from the literature on the subject, provided that reference be made to the articles from which they are taken.

A copy of the rules and any further information can be obtained on application to the honorary secretary, Mr. Arthur E. Porritt, 27, Harley Street, W.1.

The subject selected for the essay is:—

1937—'The prognosis and care of heart disease in general practice'.

1938—'The management of inoperable malignant disease in general practice'.

The 1936 Hunterian Gold Medal for practitioners was won by Dr. L. J. A. Parr, of Sydney, Australia, for his essay on 'Rheumatoid arthritis'.

### COLLEGE OF PHYSICIANS AND SURGEONS OF BOMBAY

THE council of the College of Physicians and Surgeons of Bombay at their meeting held in January 1937 decided to institute an examination for the diploma in ophthalmic medicine and surgery and appointed a committee to draw up regulations and syllabus of study for that examination.

The committee submitted its report to the council at their meeting held on the 12th March, 1937, when it was resolved that the report be approved and

adopted; and that the first examination for the diploma in ophthalmic medicine and surgery be held in July 1937.

#### Regulations relating to the examination for the diploma in ophthalmic medicine and surgery

The College of Physicians and Surgeons of Bombay shall grant a diploma in ophthalmic medicine and surgery (D.O.M.S.).

2. The seal of the college shall be affixed to every diploma.

3. The examination shall be held annually in Bombay on the last Monday in July.

4. The examination shall be open to all those registered with the Bombay Medical Council\*.

5. Candidates must apply to the secretary of the college for permission to appear at the examination at least two weeks before the date of commencement of the examination, and shall at the same time pay a fee of Rs. 100. Fees once paid shall not be refunded, but may be reserved for the subsequent examination only at the discretion of the college council, provided that the application for such reservation is made at least seven days before the date of the commencement of the examination, and good and sufficient reason is shown for the same. A candidate who fails to pass or to present himself at an examination may be admitted to one or more subsequent examinations on a fresh application being made and a fresh fee being paid.

6. No candidate will be admitted to the examination unless he produces the following certificates—

(a) Of having attended as a post-graduate for a period of nine months the clinical practice of an ophthalmic hospital or the ophthalmic department of a general hospital (having at least 20 ophthalmic beds) recognized by the College of Physicians and Surgeons.

The conditions of this certificate will be fulfilled by holding an appointment as house surgeon or house physician or as clinical assistant or as post-graduate at one of the recognized ophthalmic hospitals or ophthalmic department of a general hospital.

(b) Of having attended the following courses for a period of three months at an institution recognized by this college for the purposes of the M.C.P.S. examination:—

- (i) a course of study in optics;
- (ii) a course of study in the anatomy and physiology of the eye;
- (iii) a course of study in pathology and bacteriology with special reference to ophthalmic medicine and surgery; and
- (iv) a course of ophthalmic operative surgery.

7. The examination shall be written, practical, clinical and oral. There shall be four papers, each of three hours' duration, and each carrying 100 marks in each of the following subjects:—

- (a) Anatomy and physiology of the eye and optics;
- (b) Bacteriology and pathology of the eye;
- (c) Ophthalmic medicine and surgery; and
- (d) Relation of ophthalmology to general medicine.

There shall be practical, clinical and oral tests, carrying 400 marks as under:—

- (i) Clinical examination .. .. 100
- (ii) Dark-room examination .. .. 100
- (iii) Pathological specimens of the eyeball and microscopic slides .. .. 100
- (iv) Ophthalmic instruments, appliances and viva voce .. .. 100

8. To pass the examination, the candidate must obtain 40 per cent of the full marks in each paper, 50 per cent of the full marks in the practical, clinical and oral tests; and 50 per cent of the full marks in the

\* A candidate shall at the time of applying for permission to appear at the examination produce a certificate stating that he is registered with the Bombay Medical Council.

written, practical, clinical and oral tests taken together.

9. The subjects for study shall be—
  - (a) Anatomy and embryology of the eye, including the contents of the orbit, bones in relation thereof and the central nervous system as far as it relates to the eye;
  - (b) Physiology of vision;
  - (c) Physiological optics;
  - (d) Errors of refraction;
  - (e) Ophthalmic medicine and surgery;
  - (f) Pathology and bacteriology of the eye;
  - (g) Relation of ophthalmology to general medicine; and
  - (h) Operative surgery.
10. Every person before receiving his diploma in ophthalmic medicine and surgery shall make and sign the following declaration:—  
 'I.....do solemnly and sincerely declare that, while holding the diploma of the College of Physicians and Surgeons of Bombay, I will obey every lawful order of the council of the College, and that I will demean myself honourably in the practice of my profession, and to the utmost of my power maintain the dignity and honour of the College'.

### THE FACULTY OF TROPICAL MEDICINE AND HYGIENE, BENGAL

The following students are declared to have passed the D.T.M. examination, session 1936-37.

1. Pashupati Bose, M.B. (Cal.), assistant surgeon, Government of Bengal—awarded the 'Chuni Lal Bose' Gold Medal, 1937.  
*Passed with distinction*
2. Amar Singh, L.S.M.F. (Agra), I.M.D., sub-assistant surgeon, Government of India.  
*Passed*
3. Bachan Singh, L.M.P. (Agra), I.M.D., sub-assistant surgeon, Government of India.  
*(Arranged in alphabetical order)*

4. Balwant Singh Banda, L.S.M.F. (Punjab), I.M.D., sub-assistant surgeon, Government of India.
5. Ajit Kumar Basu, M.B. (Cal.), private practitioner.
6. Lal Mohan Bhattacharjee, M.B. (Cal.), private practitioner.
7. Shibdas Bhattacharyya, M.B. (Cal.), private practitioner.
8. Binod Lal Tewari, M.B., B.S. (Punjab), private practitioner.
9. Lala Sudhanshu Bhushan Das, M.B., D.P.H. (Cal.), private practitioner.
10. Ranadhir Das, M.M.F. (Cal.), private practitioner.
11. Sudhansumohan Das, M.B. (Cal.), private practitioner.
12. Kenneth Albert deRozario, L.M. & S., M.M.F. (Madras), I.M.D., assistant surgeon, Government of India.
13. Amar Prosad Gooptu, M.B. (Cal.), private practitioner.
14. Pramatha Nath Guha, L.M.F., L.T.M. (Bengal), medical officer, Harish Chandra Charitable Dispensary, Angaria, Faridpur.
15. Khushi Ram Joneja, M.B., B.S. (Punjab), private practitioner.
16. Satyendra Nath Mitra, M.B. (Cal.), demonstrator of pathology, National Medical Institute, Calcutta.
17. Amar Nath Pal, M.B., D.P.H. (Cal.), private practitioner.
18. Pars Ram Bali, L.M.P. (Agra), I.M.D., sub-assistant surgeon, Government of India.
19. Pasupati Rit, M.B., D.P.H. (Cal.), private practitioner.
20. Sudhir Chandra Roy, M.B. (Cal.), private practitioner.
21. Sarju Prasad, L.M.P. (Agra), I.M.D., sub-assistant surgeon, Government of India.
22. Sailesh Chandra Sen Gupta, L.M.F. (Bengal), assistant medical officer, Attabari Tea Estate.
23. Sultan Ahmed Chowdhury, M.B. (Cal.), private practitioner.

## Current Topics

### Gonococcus Filtrate (Corbus Ferry) Pædiatrics

By A. B. LeBEL  
 (From *L'Union Medicafe*, October 1936)

VULVO-VAGINITIS of a gonococcal nature presents itself often in baby girls of various ages. The onset of the disease is always the result of contagion and becomes highly contagious. In new born the infection may pass unnoticed for some time. Later on, an abundant and purulent discharge from the vagina is found on the diapers. Local examination reveals a pronounced redness, vulvar discharge, itching, erythema which in some cases is very intense. Very soon after this acute stage the infection becomes chronic and may remain so for a very long time; in fact, chronic vulvitis is considered a very serious disease because of its tenacity and strong resistance to treatment.

Early in April 1935, my attention was called to some findings made in the nursery at L'Aide a la Femme. Some of the little girls in a ward had a vulvo-vaginal discharge. It was of a yellow-greenish tint, thick, glazy, producing a starched effect on the diapers and causing adherence of the outer lips. I immediately realized that we were in the presence of an acute form of gonococcal vulvo-vaginitis. Bacteriological reports confirmed this.

Many of the little patients were contaminated by close contact in the ward. The epidemic was checked by isolation and very careful sterilization of clothing and diapers. The original cause of this infection could

not be determined but I believe it was brought in by some young patient harbouring the disease in the incubation stage.

At the very start the following treatment was established: Twice a day careful cleansing of the vulva and external region with a 0.25/1,000 solution of potassium permanganate, followed by a vaginal douche with the same solution. At night a 5 per cent silvol bougie was introduced in the vagina.

Serious difficulties are often met in this form of treatment, because of the diseased organs not having obtained their full maturity in these young patients.

This treatment did produce sensible improvement for a certain period, but a slight discharge returned as soon as local treatment was discontinued. Remissions and recurrences occurred even when the above treatment was scrupulously followed and the end of this infection seemed to me very far away. Comby reported on a little girl with such an infection of two years' duration.

Complications are not the usual rule, yet gonorrhoeal ophthalmia may be caused by pus being carried to the eyes by the child. Other complications are also to be feared, such as Bartholinitis, ano-rectal gonorrhoea, metritis, salpingitis, ovaritis. Cheadle even observed a pyosalpingitis in a 21-months-old girl. Baginsky found pus in the ovaries.

Fisher reports that Bartholin's glands are involved in one-third of his cases. Eraud claims that the cervical canal is always involved in vulvo-vaginitis.

Because of the severity of the lesions caused by the organs of these little patients and the tendency the disease has to chronicity, I was prepared to fight the

infection in different ways, and was glad to accept the suggestion made to me by Dr. G. Brisebois, of Parke, Davis and Co., to try the Corbus-Ferry gonococcus filtrate. This product was used concurrently with theelin in oil 2,000 units per cubic centimetre.

This new treatment was started on 14th December, 1935. Each child received 1/40 c.cm. of gonococcus filtrate once a week for eight weeks. Parke-Davis theelin in oil was given in doses of 1/10 c.cm. at two-day intervals for five injections.

The second injection of theelin produced an exaggerated discharge which disappeared in 48 to 60 hours. This was more pronounced in patients with a more intense infection. After the last or fifth injection of theelin the discharge had almost completely disappeared and at the fourth injection of gonococcus

filtrate no discharge could be found. The local reaction following intradermal injections of the diluted filtrate was slight except in two patients who had a very deep infection. These gave marked cutaneous reactions. No rise in temperature was noted.

During the six months' period, preceding the filtrate treatment, the microscopic reports alternated from positive to negative and from negative to positive. At the end of the treatment with the gonococcus filtrate and since then all reports have been negative.

Dr. Georges Luys, in his treatise *La Blennorrhagie*, states: 'Very often these little girls are not properly treated and at a much later period in their life it is not infrequent to find the gonococcus in the secretions of these innocent victims of a far back infection of obscure origin'.

## Reviews

**MODERN UROLOGY.** In original Contributions by American Authors. Edited by Hugh Cabot, M.D., LL.D., C.M.G., F.A.C.S. 1936. Volumes I and II. Third Edition. 1936. Henry Kimpton, London. Volume I:—General Considerations, Diseases of Penis and Urethra, Diseases of Scrotum and Testicle, Disease of Prostate and Seminal Vesicles. Pp. 951. Illustrated with 546 engravings and 12 plates. Volume II:—Diseases of the Bladder, Diseases of the Ureter, Diseases of the Kidney, Radiation Therapy of Tumours of the Genito-Urinary Tract. Pp. 862. Illustrated with 374 engravings and 9 plates. Price, £4 10s. for the two volumes

If there should be a doubt in the mind of any doctor as to the important place urology has taken in the curriculum of surgery, he has only to consult a catalogue and count the large number of books, great and small, which have been written on this subject during the last decade.

The work under review, *Modern Urology*, is not only one of the latest additions to this section of the surgical library, but it is one of the most monumental, and most useful.

The work is divided into two volumes. The first being written by 22 contributors and dealing with general conditions. Diseases of the penis, urethra, scrotum, testicle, prostate and seminal vesicles. The second deals with diseases of the bladder, ureter, kidney, and ends with a consideration of radiation therapy of tumours of the genito-urinary tract. This volume has 16 contributors.

The work opens with an historical survey of the subject of urology and an interesting description of the evolution of the cystoscope, and all the modern methods of teaching in America—the use of the phantom bladder for teaching purposes being insisted upon in all the great schools.

Great stress is laid upon the proper preparation of the patient for urological examination, especially for that of cystoscopy. The contributor states, 'Even in the hands of the most dexterous operator this simple procedure is often accompanied by considerable pain'; and he goes on to say that it is this avoidable pain which has given cystoscopy its unenviable reputation. The pain can easily be obviated by the instillation of 4 per cent novocain. This is in great contradistinction to the thought of the French urologists who maintain that the anæsthetic is in the fingers of the operator.

The whole work is so big and so good that it is extremely difficult to single out passages for special mention, but the section on the prostate must be especially called to the notice of the reader. This subject is magnificently dealt with, and all the operations for relief of senile hypertrophy of the prostate are carefully described and contrasted, a special chapter being devoted to trans-urethral resection.

The writer of the section on gonorrhœa pleads for conservative methods of treatment of this disease, and deprecates the indiscriminate use of the many 'remedies' for this condition which are continuously being put upon the market.

Diseases of the kidney and a treatise on calculi of the urinary tract are dealt with in the last few chapters, and the second volume ends with a consideration of the treatment of genito-urinary tumours by radiation therapy. If we may make one small criticism, it is that we are somewhat surprised to note that the use of mandelic acid compounds in the treatment of cystitis is merely mentioned once, and dismissed in one line. As this drug has been found by recent observers to be of the greatest value in cystitis, especially when due to the *Bacillus coli*, it is certain that future editions of *Modern Urology* will contain a more elaborate description of its use.

This work must be considered one of the great standard books of reference on urology, containing as it does all modern thought on this subject. It has been compiled with the greatest of care and attention to detail. The printing is good, the phraseology easy to read, the illustrations, plates and diagrams excellent, and the bibliography considerable.

The editor and the contributors are to be congratulated in having produced a work of the utmost value.

H. E. M.

**RECENT ADVANCES IN ANÆSTHESIA AND ANALGESIA (INCLUDING OXYGEN THERAPY).**—By C. L. Hewer, M.B., B.S. (Lond.), D.A. (R.C.P. & S. Eng.). Second Edition. 1937. J. and A. Churchill, Limited, London. Pp. x plus 284, with 113 illustrations. Price, 15s.

THE publication of the second edition, after an interval of five years, requires no apology and comes, in fact, at an opportune moment. With all the progress of anaesthesia in view, the author has dealt with the subject in the right way and produced just what is wanted and the book will prove of real value to all who are interested in this branch.

The theoretical aspect of anaesthesia is described, but the book is mainly devoted to the practical side. The chapter on biochemistry is excellent and will be useful not only to the surgeon and the anaesthetist, but also to the research worker.

The administration of anaesthesia has long been regarded as an art rather than a science, and there is little doubt that art—or more correctly judgment—still plays an important part in it. Nevertheless investigation of the many factors concerned in anaesthesia increases year by year and the modern trend is towards a scientific basis. It is no exaggeration to state that research has already been justified by the results and it is not too much to expect further advances.



The quest of improvement has, however, produced a multiplication of anæsthetic agents and methods which are bewildering, and, to add to the perplexity of situation, there is a divergence of opinion among experts as to which of these is the best. The author fulfils more aims than one; he succeeds in enabling us to sift the advantages and indications for each agent and the method to be used. Mindful of the requirements of the general practitioner he has not neglected to emphasize the value of chloroform and ether, and details are given of the administration of these agents. The chapter on shock is one calculated to be of value to the surgeon as well as to the anæsthetist, since the cause of this condition does not always seem to be fully appreciated. Finally, there is apparent, throughout the book, a clear conception of the physiological requirement and reactions of the patients, without which competence in the art of anæsthesia cannot be attained. Oxygen therapy is not a branch of anæsthesia, but its inclusion is justifiable as it embodies many of the same principles, is administered with similar apparatus and has largely been developed by anæsthetists. The format is excellent, the illustrations are clear and well selected. The book represents one of the really valuable contributions to medical literature.

R. N. C.

**BRIGHT'S DISEASE AND ARTERIAL HYPERTENSION.**—By Willard J. Stone, B.Sc., M.D., F.A.C.P. 1936. W. B. Saunders Company, Philadelphia and London. Pp. xiv plus 352. Illustrated. Price, 22s. 6d.

The volume contains a critical survey of Bright's disease and deals with its clinical features and treatment. In it the author has referred to many of the better-known recent publications and is up to date. He emphasizes the inadequacy of the previous forms of classification and leans towards the conception that nephrosis is a part of a general metabolic disturbance in which the kidneys show only a phase. His classification agrees with that of Addison with obvious affinities and he divides Bright's disease into hæmorrhagic and degenerative types, the former passing to stage of chronic arterio-sclerotic kidney with primary hypertension. Under the heading of chronic Bright's disease he also describes dividing this into latent and active types. The author considers that arterio-sclerosis with renal manifestation can best be explained by assuming that arteriolar involvement antedates the renal changes and that nephritis is either a result of the vascular changes or due to the same cause which produces an abnormal condition of the arterioles.

In the first few chapters the author deals with the physiological and biochemical aspects of the problem and the various types of nephritis are separately described with advice on treatment. The work is in general sound and conforms to the advanced line of teaching. The book is profusely illustrated and contains some beautiful microphotographs. On page 121, the author has described a simple test for blood which he claims will enable the detection of approximately 1,300 blood cells per cubic centimetre of urine. This sensitive test deserves attention in view of the great clinical importance.

The book is nicely got up and will certainly prove useful to the medical profession and the author should be congratulated on his painstaking and difficult task.

R. N. C.

**A MANUAL OF PHARMACOLOGY AND ITS APPLICATIONS TO THERAPEUTICS AND TOXICOLOGY.**—By T. Sollmann, M.D. Fifth Edition. 1936. W. B. Saunders Company, Philadelphia and London. Pp. 1190. Illustrated. Price, 32s. 6d.

PROFESSOR SOLLMANN'S *Manual of Pharmacology* is too well known to need any introduction from us and a new edition is sure to be welcome. A great demand of this important treatise has no doubt necessitated another edition in such a short period since the publication of

its previous edition in 1934. The dominant object of this manual, as Professor Sollmann says, is to furnish medical students and interested practitioners with an outline of the current conceptions of the actions of drugs, especially from the point of view of their practical importance in medicine. Unless one knows how a drug acts and its various actions on the different systems of the human body, one cannot possibly make its application in diseases, and this practical aspect of drugs has been well brought forward by Professor Sollmann.

The book has been brought thoroughly up to date, keeping abreast of all the recent development in the domains of pharmacology and therapeutics. The incorporation of the latest researches into endocrine therapy, particularly of the sex hormones, their latest nomenclatures and interrelations with other hormones, especially with those of the anterior pituitary, the vitamins, the new ergot principle ergometrine, the cyanide antidotes, dinitrophenol, neurohormones, cyclopropane, etc., have undoubtedly enriched the manual further.

The publishers are to be congratulated for the excellent get-up of the book. The inclusion of a complete bibliography at the end of the book has made the treatise more useful and valuable for the research worker and the practitioner alike and, hence, it might be considered more as a reference book than an ordinary textbook for students. The book should make a wide appeal to the medical profession at large.

R. N. C.

**HAY FEVER WITH SPECIAL REFERENCE TO TREATMENT BY INTRANASAL IONIZATION.**—By Clive Shields, B.M., B.Ch. (Oxon.). 1937. Oxford University Press, London. Humphrey Milford. Pp. 57. Illustrated. Price, 7s. 6d. Obtainable from Oxford University Press, Bombay, India

In this small book the anatomy, physiology and histopathology of the nose and paranasal sinuses are considered in some detail. This is followed by a detailed description of the author's technique of intranasal zinc ionization for the treatment of hay fever. Although this method of treatment has been in use for the last twenty-five years, it is not known how zinc ionization acts. In the absence of any satisfactory explanation the author has advanced a tentative theory; 'that in allergic nasal conditions, there is a local ionic imbalance, associated possibly with alterations in the calcic content of the tissue of the nose'. This leads to increased secretion and hypersensitivity of the nasal mucosa. Treatment by intranasal zinc ionization results in the hypersensitive mucosa being rendered less sensitive by the application of a coating of zinc albuminate to the lining membrane and an impregnation of the cells constituting that membrane with the same substance. 'Proper ionic balance can then be restored by the defence mechanisms of the body.' This hypothesis to explain the rationale of the treatment is not supported at all by any clinical or experimental evidence.

D.

**A TEXTBOOK OF PATHOLOGY.**—By W. G. MacCallum. Sixth Edition. 1936. W. B. Saunders Company, Limited, Philadelphia and London. Pp. xvi plus 1277, with 697 illustrations. Price, 42s.

As a textbook of pathology the popularity of this book is well deserved and is reflected in the production of six editions within two decades. The general arrangement of this edition follows the plan of its predecessors and the text has been thoroughly revised. The chapters on inflammation and nephritis incorporate the newer ideas of cellular mobilization. The chapters on specific infections are exhaustive and up to date, especially those dealing with bacterial infections. A new chapter has been added on mycotic diseases. Considerable additions have been made in the chapters dealing with spirochætal infections and virus diseases and the section on diseases of the endocrine glands has been thoroughly revised in the light of recent work on



the subject. A new chapter on diseases affecting teeth and related structures has been added. The illustrations of which there are many are admirable, carefully chosen and well reproduced.

This new edition worthily maintains the high standard of this well-known textbook and there cannot be any hesitation in very strongly recommending this book to students and practitioners of medicine.

C. L. P.

**SURGICAL ANATOMY.**—By Grant Massie, M.B., M.S. (Lond.), F.R.C.S. (Eng.). Third Edition. 1937. J. and A. Churchill, Limited, London. Pp. x plus 468, with 153 illustrations, many in colour. Price, 18s.

GRANT MASSIE'S *Surgical Anatomy* has just gone through its third edition. The text has been carefully revised and various additions and alterations have also been made. As in the previous editions, every endeavour has been made to strike a balance between the anatomical and surgical matter, which in itself is a creditable achievement.

The book consists of six parts, the first dealing with the head and neck. The standard routes of surgical approach to the cranial contents have been clearly explained. The next part has been devoted to the upper limb. The section on the abdomen and pelvis is full of interest. Particular mention may be made of the surgical anatomy of the stomach, the biliary tracts, and the rectum. The remaining chapters deal with the lower extremity, thorax and the vertebral column. The arrangement and distribution of the autonomic nervous system have been effectively described.

The present volume is a member of Churchill's well-known Empire Series and its popularity is well merited. The printing, get-up and illustrations are excellent. We have much pleasure in recommending it for senior medical students and their teachers.

P. N. R.

**PATHOLOGY. PARTS III AND IV.**—Revised by J. Miller, M.D., F.R.C.P.E. Fourth Edition. (Catechism Series.) 1936. E. and S. Livingstone, Edinburgh. Pp. from 153 to 308. Illustrated. Price, 1s. 6d. each part. Postage, 2d. each part

PART III deals with diseases of the vessels, ductless glands, spleen, lymphatic system, heart and of the blood. Part IV deals with inflammation, infection, fever, repair, immunity and with diseases of the bronchi and lungs. Each of the subjects is dealt with in a concise and clear manner, so characteristic of the publications in the Catechism Series.

The presentation of the subject-matter in five volumes will be found particularly valuable to the student. These books are well suited to the purpose for which they are intended.

C. L. P.

**AIDS TO PATHOLOGY.**—By H. Campbell, M.D., F.R.C.P., and K. Campbell, O.B.E., M.B., F.R.C.S. Seventh Edition. 1936. Baillière, Tindall and Cox, London. Pp. viii plus 263. Illustrated. Price, 4s. 6d.

THIS very popular member of the Students' Aids Series has passed through seven editions and six reprints since it was first published in 1907. The present edition has been revised throughout, and many of the chapters have been rewritten, bringing the whole subject matter up to date. For a student who has completed a course of pathology and who wishes to revise rapidly the subject, or a busy practitioner who wishes merely to refresh his memory on certain points, this volume has many advantages.

C. L. P.

**THE TRUE NATURE OF VIRUSES.**—By W. M. Crofton, M.D. 1936. John Bale, Sons and Danielsson, Limited, London. Pp. xvi plus 139. Illustrated. Price, 15s.

In the introduction the author states that he has attempted to prove (1) that microbes acknowledged as the cause of a disease such as the tubercle bacillus break up into a filterable-virus phase which reproduces the disease, (2) that such typical virus diseases as fowl-pox and smallpox have always associated with them microbes which transmit the disease to other animals, (3) that diseases such as distemper and influenza are caused by microbes invariably present and that the so-called viruses are virus phases of these microbes which have been proved pathogenic, (4) that sarcomata are produced by the filter-passing phases of streptothrices which can always be grown from them; the virus phases 'fertilizing' the nucleus and turning it into a malignant cell, (5) that virus phases of other microbes produce sclerosis and other tissue changes generally called degenerations.

This indeed is an ambitious project, but a careful perusal of the book leaves a very distinct impression that the author is so influenced by his own theories that to quote his own words 'he has found it difficult to write with any scientific calmness'. He is so biased by his own hypotheses that any evidence which does not fit in with his own views is dismissed as due to the result of 'bacteriological incompetence'. Of the influenza bacillus the author writes, 'I have every reason to be satisfied with my original and unshakable judgment and my freely expressed contempt for any other conclusion both then and since. Anyone holding any other opinion about this bacillus I consider an incompetent observer whose opinion is unworthy of consideration, as a person incapable of being convinced by the evidence of proof'. This contempt for modern work on virus diseases is apparent throughout the book and colours the presentation of the author's own work and theories.

The main theme of Dr. Crofton's work is that the so-called viruses are stages in the life cycle of certain bacteria and that these bacteria should be used for the production of immunity and not the viruses themselves. With vaccines made from these bacilli the author records the most astounding cures, results obtained in the course of a few hours, to quote but one case of delusional insanity who two hours after the administration of a one-million dose of influenza bacillus antigen sat down to dinner apparently perfectly sane. The author states that the result had to be seen to be believed. Although we are perfectly prepared to believe the dramatic result obtained, it would require considerably more evidence than the author records to prove that the response was of a specific nature.

The filter-passing form of tubercle bacillus is not so well established as is suggested by Dr. Crofton who states that no acid-fast granules can traverse Chamberland L<sub>2</sub> candles. Harry Plotz has shown that tubercle bacillus can traverse the Chamberland candles and the demonstration by Sacnz, Bequet and others of acid-fast organisms in normal guinea-pigs has still further weakened the virus theory of Fontes, Valtis and others.

Carrel, Heagen, Maitland and Ledingham have never been able to change the Paschen bodies into bacilli. Dr. Crofton has not apparently attempted to repeat the work of these people.

It is not clear whether the organisms isolated by Dr. Crofton are unknown to modern science or are those microbes whose special properties are not known to any scientist of repute. It is true that Ledingham has demonstrated that the virus of Agalactia can grow in the form of a streptothrix and Bedson has worked out the life cycle of Psittacosis virus, but, out of all the known streptothrices, not one has been shown to produce malignant diseases.

There is not sufficient space in a review to deal with many of the points raised by Dr. Crofton. Had these theories been presented with scientific calmness and without obvious contempt for other workers and their

findings, this book would have proved a valuable stimulus for further work on virus diseases.

**DIETETICS (HEALTH THROUGH RATIONAL DIET INCLUDING PRACTICAL HINTS ON BALANCING CEYLONESE DIET)—ALSO GIVING THE NUTRITIONAL VALUES AND PROPERTIES OF FOODSTUFFS.**—By B. S. JAYAWARDENE, L.R.C.P. & S. (Ed.). Printed by the Associated Newspapers of Ceylon, Limited, Lake House, McCallum Road, Colombo. Pp. 49. Price, As. 6

This small brochure of some 49 pages is full of a number of axioms about food, breathing exercises, and personal hygiene generally. For the modest sum of six annas a considerable amount of general information is supplied which should be of value to the layman, and Indian in particular, about healthy living. We cannot agree, however, with all the statements about food which he has quoted. Meat, for instance, is said 'not to be essential for health'; this is far from proved

as applied to the majority of mankind living in any part of the globe. Further, the low stature of the Eskimo is attributed quite unjustifiably to an almost exclusive meat diet. Apart, however, from a certain number of rather sweeping and to a certain extent uncritical statements the book as a whole is worth the money.

**BOTANY. (CATECHISM SERIES.) PART I. Fourth Edition.** E. and S. Livingstone, Edinburgh. Pp. 76, with 30 figures in the text. Price, 1s. 6d. Postage, 2d.

This is really a good piece of work. The author has endeavoured to write a book on botany covering all fundamental principles in the briefest manner possible. The catechism will be of great help and a good guide to beginners. Indeed, it would have been very valuable to the students of this country, had there been some examples from Indian flora.

## Abstracts from Reports

### HEALTH BULLETIN ON THE NUTRITIVE VALUE OF INDIAN FOODS AND THE PLANNING OF SATISFACTORY DIETS

#### IMPROVING INDIA'S FOODS

AN analysis of some 200 common Indian foods, prefaced by a summary of modern ideas about diet, is given in the *Health Bulletin* on 'The Nutritive Value of Indian Foods and the Planning of Satisfactory Diets' just issued by the Director, Nutrition Research Laboratories, Coonoor.

The publication is a part of the move to popularize the results of nutrition researches. In the early years of nutrition work the first objective was to get together the scientific data on which practical work could be extended to the homes of the people. This material has since been collected by the workers at the Nutrition Research Laboratories, and is now being made available to the public.

An account is first given of calorie requirements and standards suitable for the various age and sex groups in India are suggested. Next, protein, fat, and various vitamins and minerals are dealt with, with special emphasis on the minimum requirements of each. Malnutrition and effect of cooking on nutritive value are also discussed.

Here is an interesting excerpt from the section on malnutrition:—

A well-balanced diet is essential if growth and development are to take place normally. A badly-fed child is often small for its age and thin; its 'weight and height' will be below average. It will fall sick easily. The frequency of minor ailments in school children can be reduced by improving the diet. A certain apathy, a lack of 'pep', of enthusiasm for work and play, is characteristic of the malnourished. The state of the skin is a sensitive index of faulty feeding; a rough dry skin, or a skin covered with a papular eruption, suggests faulty feeding. Everybody knows that a well-fed animal exhibits a certain glossiness and silkiness of fur—a 'good coat'—which is not seen in poorly-fed animals. Similarly a well-fed human being has a glossy skin and a glow of health. Bright clear eyes are also a sign of satisfactory feeding.

The section on the planning of diets describes the differences between 'ill-balanced' and 'well-balanced' diets. It is pointed out that a really 'well-balanced' diet will usually cost a good deal more than ordinary Indian diets of poor quality, and how diets can be improved without great increase in cost is described. The details given are, therefore, likely to be of consider-

able interest to the public, in particular to those who are in charge of catering in institutions and schools. Stress is laid on the value of what are called the 'protective' foods.

Human beings, and particularly children, says the bulletin, cannot thrive at their best on a diet largely composed of cereals, such as rice, millet, etc., and insufficiently supplemented by other foods. To make fair quantities of such a diet, they must consume eggs, fruits, etc. These are sometimes known as the 'protective'\* foods, since they are rich in proteins, vitamins and mineral salts, and protect the body against the ills which result when the diet is largely based on less nutritious foods, such as milled rice. Cod-liver oil, which is very rich in vitamins A and D, may be classed as a most valuable 'protective' food.

In general, diets in India are defective because they do not contain 'protective' foods in sufficient abundance. The aim in public health nutrition work is general and planning 'well-balanced' diets must be to increase intake of 'protective' foods. The classes in the community which are particularly likely to suffer if their diet is defective are infants and growing children and expectant and nursing mothers.

Even a little milk, we are told, is better than none. The value of skimmed milk, which is considerably cheaper than whole milk, but contains most of its valuable elements, is emphasized. Information is given in tabular statements about protein, fat, carbohydrate, fibre, calcium, phosphorus, iron, and vitamins, and appendices are added with data about the biological value of the proteins of various foods, and the availability of iron in certain foodstuffs.

There are, of course, many kinds of public health nutrition work besides the planning of adequate diets. The task of the nutrition worker is often to make vitamin-rich preparations (e.g., milk, cod-liver oil, various special additions) to an unsatisfactory diet rather than to plan the whole diet afresh. Infant feeding is a special subject demanding special knowledge and training. But in all branches of practical dietetics an understanding of the fundamental principles of dietetics is essential for successful work in this field.

It is not only the poor, whose choice in the matter of food is extremely limited, who are ignorant and

\*The word 'protective' is used here in a much wider sense than usual; proteins, as such, are not usually included amongst 'protective' foods. We do not think that Dr. Aykroyd himself used it in this very wide sense.—Editor, J. M. G.

prejudiced about diet. Plenty of people in India and elsewhere, who could afford themselves to consume and could feed their children on an excellent diet, do not in fact do so. One can readily find, among children of the more prosperous classes, cases of serious malnutrition and food-deficiency disease.

In drawing up the new diet schedule, or in assessing the value of an existing schedule, it is essential to know whether enough food is being provided. It might be thought that it is easy enough to discover food deficiency, for such deficiency must cause hunger. But experience has shown that human beings can adapt themselves, at a low level of vitality and with their powers impaired, to an insufficient ration, and scarcely realize that they are under-fed. The nutrition worker, in setting up standards of food requirements, ignores this remarkable faculty of the body to adapt itself to semi-starvation. His standard of food intake implies full satisfaction, enough to enable human beings to lead an energetic life at a reasonably high level of working capacity.

Dr. Aykroyd, Director of the Nutrition Research Laboratories, states in an introduction that the purpose of the bulletin is to summarize available knowledge about the nutritive value of Indian foodstuffs for the benefit of public-health workers, medical practitioners, superintendents of residential institutions and others interested in practical dietetics.

By its wealth of details the bulletin is a rich source of educational and propaganda material for those whose task it is to try and improve the health and well-being of the people, both young and old.

*Public Health Commissioner.*

## ANNUAL REPORT OF THE PUBLIC HEALTH COMMISSIONER WITH THE GOVERNMENT OF INDIA FOR THE YEAR 1934

### PUBLIC HEALTH IN INDIA

IN an area of 890,000 square miles, the mid-year estimated population was nearly 276 million with a density of 310 per square mile. Births during the year numbered nearly 9½ million, and deaths a little over 6½ million, the rates per mille being 34 and 35 respectively, with the infantile mortality figure per 1,000 live births at 187.

The year presented no markedly unusual features in regard to health conditions. The death rate is higher than it was last year, and so is the infantile mortality rate, while the birth rate is lower. But such fluctuations in the recorded deaths must be expected from the present system of registration and too much stress should not be laid on them.

### LIVE BIRTHS

The crude birth rate during the year was 33.7 per mille of the total estimated population as against 35.5 per mille in 1933 and 35 per mille the quinquennial mean. Including still-births, the rate was 34.3. Live births registered during the year were 4 per cent less than the figure of 1933. Compared with 1933, the Punjab recorded a decrease of a little over less than 100,000 births or of 10 per cent, the United Provinces nearly 120,000 or 7 per cent, Bihar and Orissa 79,000 or 6 per cent, and Madras 70,000 or 4 per cent. In Delhi, Bengal, Bombay, Assam and Ajmer-Merwara there were slight decreases. Small increases occurred in North-West Frontier Province, the Central Provinces, Burma and Coorg.

Birth rate calculated on the basis of the estimated number of women of child-bearing age, taken as 15 to 40 years, was 167 per mille for the whole of British India. Of the provincial figures, that for the Punjab, namely 215, is the highest. The Central Provinces is second with 209, and Delhi third with 197. The figures for the other major provinces are as follows: North-West Frontier Province 156, United Provinces 179, Bihar and Orissa 157, Bengal 139, Bombay 172, Madras 163, Assam 153, and Burma 144. The period of 15 to 40 years is possibly pitched too high, particularly for the southern half of India, but it is probably correct in

indicating a child-bearing period five years shorter than the European one.

Of the total births, 17.5 per mille were male, 16.1 female. The excess of males over females born is a constant feature. Taking British India as a whole the number of males born per 100 females is 108. Amongst the provinces this figure is 129 in North-West Frontier Province, 119 in Ajmer-Merwara, 113 in the United Provinces, and 112 in the Punjab. The other provincial figures vary near about the British India mean except that the figure for Burma is 104.

The birth rates for the whole of British India in rural and urban areas were the same, namely 34 per mille, but amongst the provinces the rural rate continued to exceed the urban in the Punjab (+6 per mille), Bihar and Orissa (+13 per mille), Bengal (+8 per mille), Bombay (+2 per mille), and Madras (+15 per mille). In other provinces it was lower. The high rural rates in Bihar and Orissa and Bengal are mainly due to the fact that a large proportion of the rural population who have migrated to urban centres return to their rural homes for child birth.

The birth rates for the chief communities, which are available for ten provinces, were as follows:—

### Hindus Mohammedans Christians

North-West Frontier Province	28	31	31
Delhi	37	43	21
United Provinces	37	37	10
Bihar and Orissa	34	33	21
Bengal	28	29	20
Central Provinces	40	41	19
Madras	36	38	33
Coorg	26	19	20
Burma	17	28	23
Ajmer-Merwara	35	34	7

As usual, the birth rate exceeded the death rate in every province, the largest difference being recorded in the Punjab (+12 per mille), Madras (+11 per mille), Assam (+11 per mille), North-West Frontier Province (+10 per mille), Bombay (+10 per mille), United Provinces (+9 per mille), and Burma (+9 per mille).

### DEATHS

Compared with 1933 and quinquennial mean, the death rate of 24.9 per mille increased by roughly 3 per mille and by 1 per mille, respectively. These figures reflect the relative unhealthiness of the year, particularly in Bihar and Orissa, the Central Provinces and the United Provinces, where the rates exceeded those for 1933 by 13 per mille, 10 per mille, and 8 per mille, respectively. Slightly higher mortality was returned also in Madras, Burma and Ajmer-Merwara. Female mortality exceeded male mortality in the Central Provinces (+3 per mille), Bihar and Orissa (+2 per mille), and in North-West Frontier Province, United Provinces, Madras, and Burma (each +1 per mille). But taking India as a whole, the male mortality was greater than the female, the respective figures being 25.1 and 24.6.

Mortality from the principal epidemic diseases increased during this year. Deaths from cholera, which were nearly 200,000, have been nearly three times what they were in 1933. Plague mortality which was 80,000 is almost double, but deaths from smallpox numbering about 84,000 is low. The other principal causes of death show comparatively little change. But in the main the figures are higher, particularly under the heading fevers, while the deaths recorded, numbering about 4 million, show an increase of over 400,000 over the figure for the previous year.

Health conditions for the rural population were specially unfavourable owing to the greater prevalence of fevers and cholera among them. The death rates exceeded those for urban areas by 9 per mille in Delhi, 8 per mille each in Bihar and Orissa and Madras, 7 per mille in the Punjab, 4 per mille in Ajmer-Merwara, 3 per mille in North-West Frontier Province, 2 per mille each in Bengal and Assam, and 1 per mille in the Central Provinces, while for British India as a

whole the rates were 24.9 for rural areas and 24.4 for urban areas.

The death rate for the age period, 15 to 40, was as usual higher among females than among males, and the cause is ascribable to the greater risk of death to which women are exposed during child-bearing ages, the rates being 10.7 for males and 12.4 for females.

Considering deaths by communities, the rates for the whole of British India are 28 for Hindus, 24.2 for Mohammedans and 17.5 for Christians. The provincial figures are as follows:—

#### Hindus Mohammedans Christians

North-West Frontier Province	.. 15	21	14
Punjab	.. 29	27	25
Delhi	.. 33	25	10
United Provinces	.. 26	29	5
Bihar and Orissa	.. 27	23	17
Bengal	.. 23	24	14
Central Provinces	.. 34	32	..
Bombay	.. 28	17	14
Madras	.. 34	22	19
Coorg	.. 22	27	..
Assam	.. 18	20	18
Burma	.. 21	15	14
Ajmer-Merwara	.. 31	27	3

#### INFANTILE MORTALITY

The year 1934 was comparatively unhealthy for the infant population in India. The recorded deaths, nearly 1,700,000, were 9 per cent more than in 1933 and 10 per cent higher than the quinquennial mean; 187 out of every 1,000 born are reported to have died. The persistent high mortality of infants may be ascribed in part to defective registration not only of births but of infant deaths through the inclusion of still-births, and partly to the tendency of the more illiterate of the population to underestimate the age of the diseased infant.

The provinces chiefly contributing to the increased mortality were the United Provinces (+39 per cent), Bihar and Orissa (+11 per cent), the Central Provinces (+26 per cent), Burma (+14 per cent), and Ajmer-Merwara (+14 per cent). Minor increases also occurred in Bombay and Madras Presidencies and in Assam.

The wastage of infant life calculated in live births was the highest in the Central Provinces, Ajmer-Merwara, Burma, and Delhi. In these provinces one child in every four or five of recorded births failed to survive the first year of life, whilst the percentage of deaths of one week and above was high in Bengal, Madras, Coorg, and Assam, that in Burma was high among infants aged 1 to 6 months, probably due in part to the local custom of partial feeding at too young an age with rice pre-masticated by the mother. As in previous years, the steady fall in mortality accompanies the monthly increase in age of infants from 1 to 12 months. These figures suggest that besides defective registration, skilled maternity or midwifery service is inadequately or poorly provided, specially in the rural tracts, and that the indigenous *dai* as she is much cheaper is still in popular demand. The uniformly low death rate among Christians lends support to this view, as the majority of Hindus and Muslims still follow the primitive methods.

The poor nutrition of the mother, over-crowding, a high birth rate and high maternal mortality rate, frequent prematurity, and the prevalence of respiratory diseases, convulsions, malaria and syphilis, combined with widespread ignorance of infant management, all contribute to the great loss of infant life in India. Birth rate, as also infantile death rate, is high among the poorer classes owing to the inaccessibility to them of efficient medical service.

Figures are available for some provinces to show the chief causes of infantile mortality. In Delhi, for instance, febrile and respiratory diseases were responsible for the largest number of deaths. In the Central Provinces debilitating influences, dietetic errors

and deficiencies, malaria, maternal pre-natal weakness and neglect, bad housing, high birth rate, lack of medical aid and ignorance of the bringing up of infants are stated to be the main contributory factors. In Bombay city debility, malformation and premature birth and respiratory diseases appear to be responsible for the largest number of deaths.

The recorded still-births for British India were 19.9 per mille of live births. This figure as also the provincial figures cannot, however, be regarded as accurate, as owing to defective registration many still-births are included in the infantile mortality returns. The infantile mortality figures for the different classes of population are recorded in seven provinces only and are given below. It will be noticed that a uniform low death rate among Christians continued to be reported from these provinces:—

#### Hindus Mohammedans Christians

North-West Frontier Province	.. 181	132	77
Punjab	.. 194	183	165
Delhi	.. 237	171	145
Bihar and Orissa	.. 155	136	138
Madras	.. 209	183	127
Coorg	.. 187	218	75
Ajmer-Merwara	.. 231	258	102

The rural and urban infantile death rates for British India were 183 and 218 per mille of live births. The urban mortality of infants in the Punjab has declined steadily during the last three years. The urban mortality figures were particularly high in Ajmer-Merwara where it exceeded the rural rate by 149 per mille, and in the United Provinces and Bombay where it was higher by 96 and 63 per mille, respectively. The rural death rates were higher than urban in Coorg, Delhi, Assam, Burma, and the Punjab, the persistently low urban rate in Coorg being due to the presence of a large number of plantation labourers who leave their families at home.

Of the total registered deaths in British India, 42 per cent as against 45 in 1933 occurred among children under 5 years of age, and 6 per cent among those aged 5 to 10 years. In other words, nearly half of all those who died were children under 10 years of age. The percentage, however, shows a drop of 2 from the previous year's figure, which was 50.

#### HOW INDIA COMPARES WITH OTHER COUNTRIES

	Birth rate per mille	Death rate per mille	Natural increase per mille	Infantile death rate per 1,000 births
British India ..	33.7	24.9	8.8	187
England and Wales ..	14.8	11.8	3.0	59
Scotland ..	18.0	12.9	5.1	78
Belgium ..	16.0	12.2	3.8	82
Czechoslovakia ..	18.8	13.2	5.6	126
Denmark ..	17.8	10.4	7.4	64
France ..	16.1	15.1	1.0	69
Germany ..	18.0	10.9	7.1	66
Hungary ..	21.4	14.4	7.0	150
Italy ..	23.2	13.1	10.1	99
Netherlands ..	20.7	8.4	12.3	43
Norway ..	14.8	9.8	5.0	..
Portugal ..	28.4	16.6	7.8	..
Roumania ..	32.4	20.7	11.7	182
Spain ..	26.2	15.9	10.3	113
Sweden ..	13.7	11.2	2.5	47
Switzerland ..	16.2	11.3	4.9	46
Canada ..	20.4	9.4	11.0	72
New Zealand ..	16.5	8.5	8.0	32
South Africa (White) ..	23.5	9.7	13.8	62
U. S. A. ..	17.1	11.0	6.1	60
Japan ..	30.0	18.1	11.9	125
Egypt ..	40.0	26.6	13.4	166

These figures show that the only countries with which there can be any comparison with British India on the point of birth rate are Japan, Egypt and Roumania. In the death rate again it is only Egypt which is worse than India. So far as infantile mortality is concerned, the only countries having rates at all comparable with those of India are Roumania, Hungary, Egypt, Portugal, Czechoslovakia, and Japan.

#### CAN INDIA SUPPORT AN INCREASED POPULATION?

In the report for 1933 it was stated that by 1941, at a conservative estimate, the population of India will probably considerably exceed the figure of 400 millions. This is considered once again and the conclusion arrived at is that the figure of 400 millions mentioned in last year's report is likely to be near the mark.

The question, therefore, arises 'Can increased population be balanced by increased good production?' In dealing with this question, there are several points to bear in mind. Agricultural research is continuously showing the way to increased yields. There are areas under wheat yielding 14 maunds to the acre which could be made to yield double that amount. In the present state of our knowledge, it is not safe, therefore, positively to assert food production cannot keep pace with the increase in population. Although there is evidence of widespread under-nutrition in India, there is nothing to show that the ryot is worse fed now than he was in earlier days. Rather is it probable that the absorption of food-stuffs has over a period of years risen in proportion to the population. Another factor which has a bearing on the population question is the relation of the birth and death rates. To those who believe that improved economic conditions or a rise in the standard of living will be followed by a drop in the birth rate there is some evidence that economic conditions are improving, while for those who hold that sooner or later increasing density will, by means which have not yet been satisfactorily demonstrated, lower fertility, there may be some consolation in the undoubted fact that population density is increasing in India. One other important factor in connection with the birth rate is the age of marriage. There is a considerable volume of opinion among those qualified to judge that the age of females at marriage is rising; this rise will tend to reduce fertility and therefore lower the birth rate.

If food production keeps pace with population increase, a critical situation may be avoided. But India needs more than this. A higher standard of living, with all that this brings in the way of improved health and welfare, is a pressing need. This can only be secured, in a predominantly agricultural country, by a considerable increase in food production or a pronounced drop in the annual increment of population.

#### NUTRITION

But whatever may be the solution of the population problem in India, no one will deny that our large annual increase in population requires that attention should be directed to a greater extent than has hitherto been the case on the important subject of nutrition. A great deal of research has been carried out in the nutrition research laboratories of the Indian Research Fund Association at Coonoor, and the results of this research require to be made known to the public. Over and above this there is need for an investigation into the state of nutrition and dietary habits of the people on which our information is lamentably deficient.

#### RURAL HYGIENE

Sanitary improvement in rural areas, where the vast majority of the people of India live, is one other outstanding need of the country. In these areas, educationally, socially and materially backward as the people are, compared with those in urban areas, general sanitation is still in a primitive condition. Medical relief for the most part is grossly inadequate and maternity and child-welfare works are almost completely lacking.

A beginning has, however, been made in a number of areas. Rural health units are now being established and are likely to be of great assistance, both as experimental stations for trying out schemes of village improvement and as demonstration and educational centres.

#### AERIAL NAVIGATION AND YELLOW FEVER

A potential danger to the public health of India is the possibility of yellow fever coming in. And this danger has become acute as a result of the recent development of rapid aerial communication between India and Africa, the main endemic home of yellow fever, which is now only a few days distant in time from India; an infected person embarking on a plane in Africa can now arrive in India in the infective stage of the disease. Should yellow fever happen to be introduced into India, the disease would be so appalling that it may well cripple the country for a generation. All the necessary factors for the rapid spread of the disease if the virus be introduced are present, and it is essential that precautionary measures should forthwith be taken. These consist in freeing the cities, and particularly the seaboard towns, of the stegomyia mosquito and in establishing adequate quarantine facilities for isolation of suspected cases and their contacts in mosquito-proof buildings at the airport of entry in Karachi. Fortunately quarantine measures have already been taken at Karachi and are in progress.

(To be continued in the next issue)

#### THE SIXTEENTH ANNUAL REPORT OF THE BLIND RELIEF ASSOCIATION, BIJAPUR, 1935

THE association was started in the year 1920 and owes its existence to the solid support and enthusiasm of the people of Bijapur District. It is the first philanthropic association of its kind in the Karnatak and was established for the prevention and cure of blindness primarily in the District of Bijapur, and funds permitting, in the surrounding Districts and States also.

From the incidence of blindness in the Karnatak it can be judged that whatever be the cause of blindness no less than 30 to 40 per cent of these cases are remediable and an equal number preventable. For this purpose we have been carrying on propaganda work amongst the village population by lectures and magic lantern demonstrations on personal hygiene and village sanitation, and are hunting out cases of diseases such as smallpox and measles which are likely to give rise to serious eye afflictions.

Baby Week Shows and Village Maternity and Child-Welfare Centres should have a place for the eye, where attempts can be made to impress on the minds of the public the importance of eyes, their susceptibility to infections, and the possibility of preventing such infections, if care is exercised at the proper time. This principle has been specially observed in this district by the introduction of a special stall at these shows exhibiting the various common eye ailments, explaining their common causes by various charts, pamphlets, posters and also arranging a small exhibition of the common remedies and precautionary measures, which could easily be practised by the public and thus the onset of eye afflictions and their sequelæ averted.

Preventive work has been carried out by this association through its field workers in the villages of the district for the last 17 years. This has done immense good to thousands of poor patients. The association offers certain special facilities to the poor and deserving patients. Among such facilities may be mentioned journey charges to and from the civil hospital, supply of food and clothing during their stay and a pair of spectacles for those operated on, in addition to the free medical and surgical treatment. In spite of all such facilities, patients very often keep away for want of proper education, ignorance and superstition. Occasions are not infrequent when they have to be persuaded to undergo treatment.

There were eleven field workers, one for each of the eight Talukas, viz, Bijapur, Indi, Sindgi, Bagewadi,



## Service Notes

## APPOINTMENTS AND TRANSFERS

MAJOR-GENERAL E. W. C. BRADFELD, C.I.E., O.B.E., K.H.S., Officiating Director-General, Indian Medical Service, is confirmed in his appointment, with effect from the 1st March, 1937.

Lieutenant-Colonel W. E. R. Dimond, Assistant Director of Public Health, North-Western Frontier Province, is appointed to officiate as Inspector-General of Civil Hospitals and Prisons of that Province, with effect from the 14th January, 1937, till further orders.

Lieutenant-Colonel J. M. R. Hennessy, Civil Surgeon, Jubbulpore, is appointed to officiate as Inspector-General of Civil Hospitals, Central Provinces, vice Colonel N. M. Wilson granted leave, with effect from the afternoon of the 17th February, 1937, till further orders.

Lieutenant-Colonel D. H. Rai, M.C., is appointed to officiate as Inspector-General of Civil Hospitals, Punjab, with effect from the 12th March, 1937, or the date on which he may assume charge, vice Colonel C. H. Reinhold granted leave.

Lieutenant-Colonel T. D. Murison, Director of Public Health, Assam, is appointed to officiate as Inspector-General of Civil Hospitals and Prisons, Assam, with effect from the afternoon of the 31st March, 1937, till further orders.

Lieutenant-Colonel F. J. Anderson, Professor of Surgery, Medical College, Calcutta, is appointed to act as the Principal, Medical College, Calcutta, in addition to his own duties for the period from the 8th April, 1937, to the 20th May, 1937, vice Lieutenant-Colonel T. C. Boyd granted leave.

Lieutenant-Colonel H. E. Murray, when appointed as Professor of Midwifery, Medical College, Calcutta, in place of Lieutenant-Colonel P. F. Gow, will act as the Principal, Medical College, Calcutta, in addition to his own duties for the period from the 21st May to the 9th June, 1937, vice Lieutenant-Colonel T. C. Boyd granted leave.

Lieutenant-Colonel H. E. Shortt, Officiating Director, King Institute, Guindy, is confirmed in that appointment, with effect from the 13th August, 1936, vice Lieutenant-Colonel H. H. King retired.

The services of Lieutenant-Colonel R. C. Clifford, M.C., D.S.O., are placed at the disposal of the Chief Commissioner, Delhi, for appointment as Civil Surgeon, New Delhi, with effect from the forenoon of the 15th February, 1937.

Major G. C. Maitra, an officer of the Medical Research Department, at present officiating as Director, Pasteur Institute, Rangoon, is confirmed as Director, Pasteur Institute, Kasauli, with effect from the 13th August, 1936, vice Lieutenant-Colonel H. E. Shortt. He will continue to be employed as Officiating Director, Pasteur Institute, Rangoon, until further orders.

Major T. H. Thomas, on return from leave, is appointed, until further orders, to act as Professor of Medicine, Medical College, and Physician, College Hospitals, Calcutta, vice Lieutenant-Colonel E. H. V. Hodge.

Major T. H. Thomas, when appointed to officiate as Professor of Medicine, Medical College, Calcutta, in place of Lieutenant-Colonel E. H. V. Hodge, will act as the Superintendent of the Medical College Hospitals in addition to his own duties during the absence on leave of Lieutenant-Colonel T. C. Boyd, for the period from the 8th April to the 9th June, 1937.

The services of Captain Said Ahmad are placed temporarily at the disposal of the Government of the United Provinces, with effect from the forenoon of the 5th February, 1937.

Captain E. A. O'Connor, an Officiating Agency Surgeon, is posted as Medical Officer, Meshed, with effect from the afternoon of the 20th February, 1937.

Muddebihal, Bagalkot, Hungund and Badami, one for Bilgi Petha, and one has been entirely working in the municipal area of Bijapur. A special field worker has been maintained at Akalkot. The field workers have been specially trained at the civil hospital in washing the eyes and the management of common diseases. They are in a position to recognize any serious affliction requiring operative treatment and are instructed to send such cases to the nearest dispensary or camping place of the touring medical officer or the civil hospital, according to the seriousness of the complaint and the treatment required for them. Each field worker is given charge of a number of villages. He tours these villages by rotation, finds out cases for treatment by house to house visits, treats them and gives them medicines for further treatment during his absence.

On his rounds, if he comes across cases of blindness which are not curable, he takes them on his register which enables us to collect proper statistics about the incidence of blindness in this district. He also inspects births for ophthalmia neonatorum. On an average he can visit two to three villages in a day. The field workers are supplied with ponies and they carry with them a box which contains solutions of boric acid, silver nitrate, sodium chloride, argyrol and mercury and dionine ointments, some cotton-wool, a bowl and a kidney tray. They maintain a record of their work in special registers supplied to them. The total number of cases treated by them during the year was 22,991.

Birth inspection is an important portion of preventive work. The total number of birth inspections done by the field workers during the year was 24,889 and the inspection was repeated in the case of 34,682. A separate record of births examined within ten days of birth is also kept and the number of children so examined was 3,726. The examination was repeated within 10 days in the case of 632. The number of treatments done in the course of these examinations of children under one year of age for ophthalmia neonatorum was ten and for other diseases 6,142. The number of cases of eye diseases among children under five years of age detected and treated was 6,036. Amongst these five were cases which required surgical interference and had to be sent to the civil hospital.

It is evident from this abstract that this association is carrying on valuable work and its example might be followed with advantage in almost any other part of India.]

## Correspondence

AN UNUSUAL RESULT OF AN ACCIDENT  
To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—A boy, aged about eight years, was knocked down in a motor accident and run over by a motor bus. A wheel is said to have passed over him.

He was brought dead to the hospital and the post-mortem examination revealed ruptures of the liver, spleen, lungs, and right kidney; the abdomen was ruptured and the intestines protruded therefrom.

The thorax was severely crushed and laid open. The heart was found lying free in the thoracic cavity and completely detached from all its blood vessels. This is a rare thing. Many cases of ruptures of the spleen, liver, kidney, intestines, etc., are observed in motor or railway accidents, but the entire detachment of the heart from the blood vessels is a rarity and therefore this letter is sent for publication.

Yours, etc.,

S. D. MEHTA, M.C.P.S., B.M.S.,  
Lecturer in Materia Medica and  
Jurisprudence, Civil Hospital.

AHMEDABAD,  
19th March, 1937.



## LEAVE

Brevet-Colonel R. N. Chopra, C.I.E., K.H.P., Officiating Director and Professor of Pharmacology, School of Tropical Medicine, Calcutta, is granted leave, ex-India, for 1 month, with effect from the 15th July, 1937, and is permitted to prefix the summer vacation of the School from the 16th April, 1937, to the 14th July, 1937, to the leave.

Lieutenant-Colonel T. C. Boyd, Principal, Medical College, and Superintendent, Medical College Hospitals, Calcutta, is granted leave, ex-India, for the period from the 8th April, 1937, to the 9th June, 1937.

Lieutenant-Colonel E. H. V. Hodge, Professor of Medicine, Medical College, and Physician, College Hospitals, Calcutta, is granted leave for 6 months with effect from the 9th April, 1937.

Lieutenant-Colonel S. A. McSwiney, Officiating Professor of Obstetrics, Medical College, Calcutta, is granted leave for the period from the 13th to 20th October, 1937, in extension of the leave already granted to him.

## PROMOTIONS

*Majors to be Lieutenant-Colonels*

- S. L. Patney. Dated 2nd February, 1937.  
D. N. Bhaduri. Dated 4th February, 1937.  
B. Basu, O.B.E. Dated 5th February, 1937.  
M. A. Jafarey. Dated 25th February, 1937.  
G. Verghese. Dated 27th February, 1937.  
A. D. Loganadan. Dated 27th February, 1937.

## RETIREMENTS

Major-General Sir Cuthbert Allan Sprawson, Kt., C.I.E., K.H.P. Dated 1st March, 1937.

Major-General A. W. M. Harvey, K.H.S. Dated 9th February, 1937.

## Notes

## THE TREATMENT IN BAD-NAUHEIM, GERMANY

LIFE under present-day conditions demands healthy, brave and happy people. But simultaneously, life makes heavier calls on the energy of man, and this must inevitably place a great strain on the heart. A course of treatment in watering-place for heart affections, on the first signs of heart complaints, or in their more advanced stages, has, therefore, won enormously in importance. As a rule, heart complaints can be traced back to other diseases, it adds enormously to the importance of the world-renowned watering-place Bad-Nauheim that its rich store of healing powers not only combat the effects of a given complaint, but also serve to remove the original causes. The natural heat of the soils and its brines in various amalgamations and structures, supplemented by all the resources of medical skill, constitute the basis for the celebrated therapeutics of Bad-Nauheim. The beneficial effects are not confined to the treatment of heart complaints; on the contrary, the unique and beneficial effects are equally striking in cases of rheumatism, complaints of metabolism, complaints of the respiratory organs and nervous system, and for a state of exhaustion.

In the town itself he is surrounded by the stillness and peaceful rest which are absolutely essential, if the healing mediums are to do their work to the full. But more than all this, the guests are always ready to confess that Bad-Nauheim itself is a veritable experience which will always be numbered among the pleasantest remembrances in life.

'TABLOID' BRAND SULPHONAMIDE-P, 0.5 GM.  
(P-AMINO BENZENESULPHONAMIDE)

'TABLOID' brand sulphonamide-P, 0.5 gm., recently issued by Burroughs Wellcome and Company, presents

p-aminobenzenesulphonamide for administration by mouth in hæmolytic streptococcal infections. It has been shown experimentally that, following administration of this chemotherapeutic substance, the blood of man and animals becomes bactericidal to hæmolytic streptococci. The clinical evidence available pending the publication of the results of official trials is favourable although limited.

Before deciding to use 'Tabloid' sulphonamide-P in the treatment of severe streptococcal infections, such as puerperal septicæmia, erysipelas, etc., it is suggested that patients should be submitted to full bacteriological examinations to establish clearly the presence of hæmolytic streptococci in the lesion or in the blood stream. 'Tabloid' sulphonamide-P should be administered orally in a total daily dose of six to ten 0.5 gm. products after meals, the full dosage being continued for six days after the temperature becomes normal. In the event of some gastric disturbance following large dosage—the only troublesome symptom so far reported—the dose might be reduced temporarily. 'Tabloid' sulphonamide-P may be tried intramuscularly when oral administration is found to be impossible. In such a case the low solubility of the substance (1.2 per cent) makes the total amount that can be conveniently given by this method undesirably small. For intramuscular injection one 'Tabloid' product should be boiled up in 40 c.cm. of 0.7 per cent saline, and the solution cooled to body temperature before injecting. Clinicians using sulphonamide-P are invited to send reports for consideration with those of the official trials.

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## Original Articles

## MYELOID LEUKÆMIA: THE TREATMENT BY DEEP X-RAYS

By L. EVERARD NAPIER, M.R.C.P. (Lond.)  
Acting Professor of Tropical MedicineP. C. SEN GUPTA, M.B. (Cal.)  
Clinical Assistantand  
R. N. CHAUDHURI, M.B. (Cal.)  
Assistant Professor of Tropical Medicine  
Calcutta School of Tropical Medicine

THE incidence of myelogenous leukæmia in this country appears to be about the same as in Europe and America, but reliable statistics are not available. In the kala-azar clinic at the School, each year during the last 15 years, two or three cases of this disease have been encountered amongst the patients presenting themselves as cases of kala-azar, and from time to time cases have been admitted to the wards of the Carmichael Hospital for Tropical Diseases for treatment. In August this year three patients with this disease sought admission to the hospital within a very short period. We, therefore, decided to admit, treat, and make a special hæmatological study of as many patients suffering from this disease as we could collect, especially with reference to their response to treatment. We were able to collect six cases within a very few weeks; all were admitted to the hospital.

The patients were all Indian males, aged between 30 and 40, except for one boy who was only 15 years old. In this boy the disease was in a very advanced stage and progressed rapidly causing his death within six weeks from the time of his admission. Another patient showed a steady improvement for about five months when he suddenly had a return of all his symptoms and died within a fortnight. The other four patients progressed favourably under treatment.

In two cases some treatment had been given already; in one, this treatment had been by deep x-ray therapy and had brought about some degree of improvement; in the other, benzol had been given with little effect. In all cases the only specific treatment that we adopted was deep x-ray therapy; at first moderate doses were given twice a week, but later we arranged for them to receive treatment daily—or rather on six days in the week. We carried out a preliminary sternum puncture in five of the cases, and a spleen puncture in two.

A summary of the notes in the six cases together with charts and tables are given below:—

Case 1.—A Hindu boy, aged 15 years, a student, was admitted into the Carmichael Hospital for Tropical Diseases on 27th July, 1936, for progressive enlargement of the spleen, associated with irregular fever.

Spontaneous enlargement of the spleen had been first noted about seven months before; this was followed by progressive weakness, loss of weight, and anæmia. He had also had fever, either low intermittent or continuous, for the last four months. He was given a course of antimony injections previous to his admission, presumably because he was thought to be a case of kala-azar, but without effect. His previous history was unimportant; he had had chicken-pox in 1935 and occasional attacks of fever. There was nothing particular in his family history. The patient was anæmic, emaciated and looked very ill. There was cedema around the ankles, which was said to have been present for a fortnight before admission. The tongue was clean and moist. The throat was congested and the cervical glands were enlarged on both sides. The heart was of normal size; a hæmie bruit was present. The pulse was regular and the rate was 108 per minute. Nothing abnormal was detected in the lungs. The abdomen appeared protuberant; the spleen was enlarged nine inches below the costal margin; its consistency was hard, but there was no tenderness. The

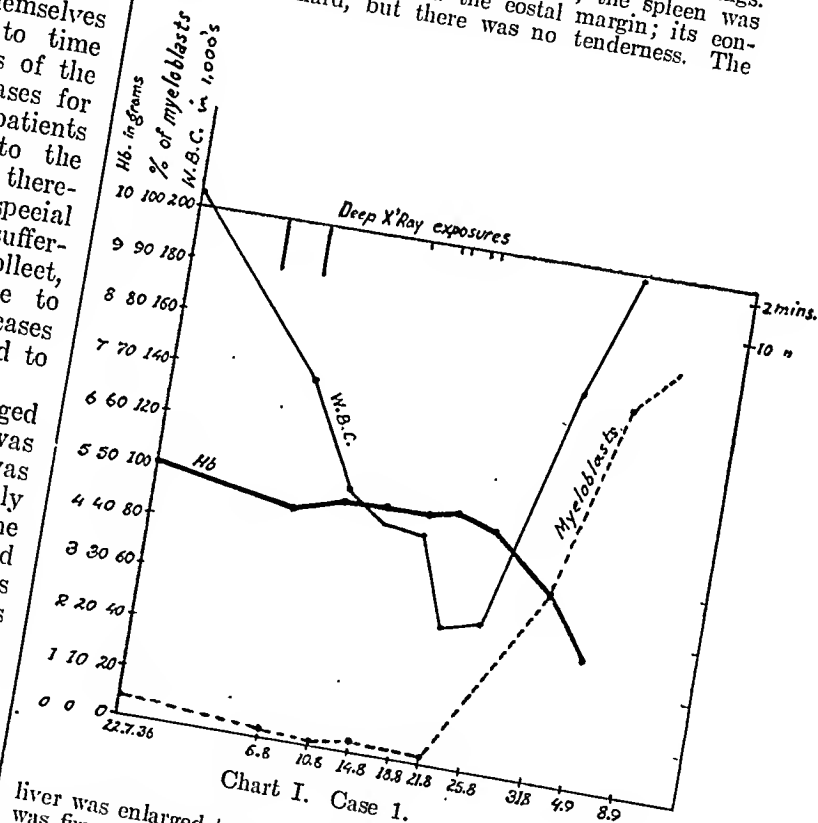


Chart I. Case 1.

liver was enlarged two inches below the costal arch and was firm with a sharp lower border. The examination of the central nervous system revealed no abnormality.

Ophthalmoscopic examination showed retinal changes typical of myeloid leukæmia. Both arteries and veins were tortuous and markedly dilated, and there were many characteristic extravasations; these appeared as white spots and patches surrounded by red rims. The discs appeared large, and the edges were slightly blurred (*vide* plate XVIII).

The results of the blood examinations are recorded in table I.

The patient was given two deep x-ray exposures over the splenic area on the 31st July and 4th August, and from the 14th to the 21st August he received five more short exposures. Details of dosage are—voltage—150 kilovolts; current—5 milliamperes; distance—40 cm.; filter—3 mm. of aluminium. Duration of exposures was 10 minutes on 31st July and 4th August, and 1 minute 20 seconds for the remaining five exposures.

As the patient was very anæmic, he was given a course of ferrous sulphate—grs. 18 daily for 22 days—and, as his Wassermann reaction was positive, a course of six injections of solvarsin (Bayer).

With this treatment, though the total leucocytes decreased to a great extent, there was no improvement in his general condition or in his anæmia. There was a definite lowering of the number of the red cells (by nearly a million) though the hæmoglobin percentage remained steady during this period. The fever continued, he had frequent attacks of diarrhœa with passage of mucus and blood, and he grew more and more cachectic. There was no decrease in the size of the spleen. We then decided to stop the x-ray therapy. He was given liquor arsenicalis by mouth.

The patient then began to go rapidly down hill; the anæmia increased, the temperature rose to higher levels, there was intractable diarrhœa, the heart became dilated, its rate increasing from 120 to 130 per minute, the œdema of the legs increased and the patient became profoundly cachectic. On 4th September, we noticed purpuric spots all over the body. A platelet count done on this date showed a definite diminution (89,080 per c.mm.). The leucocyte count increased very rapidly after the cessation of deep x-ray exposures and on 25th August the blood film showed little else but free or disintegrated white-cell nuclei and red cells; as there were very few white cells showing any cytoplasm, it was impossible to make an accurate count. Three days later we found that there had been a sharp rise in the myeloblasts to 36 per cent of the total white cells; the percentage of these cells continued to rise and on 8th September was 82 per cent; there was also a

fever. He gradually grew weak and anæmic and subsequently his legs began to swell. He also suffered from pain in the joints with occasional attacks of high fever (up to 105°) lasting a day or two. He had tinnitus about four months before admission.

*Previous history.*—He suffered from pneumonia in childhood, malaria 12 years ago, pleurisy seven years ago, and dysentery ten months ago. He was given a course of antimony injections, empirically, without any effect.

On admission, the patient appeared slightly anæmic. General physical examination showed enlargement of the spleen three inches below the costal margin. The liver was palpable and tender. The sternum was tender. There was slight ptosis of the left eye with a chalazion on the lower lid. He complained of severe headaches. The heart, lungs and urinary and central nervous systems were normal. The fundus oculi was found healthy.

On 9th July, the leucocyte count was 53,700 and the red blood cell count 2,440,000 per c.mm., and the cholesterol content of the blood 0.130 per cent. The Wassermann reaction was 'doubtful'.

*Gastric analysis.*—The free-acid curve was very much below the normal level.

At this time the patient was under the charge of another physician. He was given thrice daily doses of benzol (minims v) in olive oil for a week, six doses of sulpharsenol, three deep x-ray exposures and medicinal treatment of various kinds during the first month he was in hospital. The total white cell count was the only blood examination made; this fluctuated between 40,000 and 60,000 and was 70,000 at the first examination carried out by us.

TABLE I  
Summary of blood findings in case 1

Date	Hæmoglobin per cent = gm. per 100 c.cm.	Red blood cells per c.mm.	White blood cells per c.mm.	PERCENTAGE DISTRIBUTION OF LEUCOCYTES							Nucleated R. B. C.
				Lymphocytes	Large mononuclears	Myeloblasts	Myelocytes	Polymorphonuclear neutrophils	Eosinophils	Basophils	
22-7-36	37 = 5.087	2,980,000	205,000	4	1	4	36	54	.1	0	+
29-7-36	..	2,280,000	..	..	..	..	..	..	..	..	..
5-8-36	33 = 4.537	2,100,000	140,000	5	0	2	15	77	1	0	+
10-8-36	35 = 4.81	2,180,000	100,000	8	0	1	19	72	0	0	+
14-8-36	35 = 4.81	2,240,000	90,000	8	0	2	16	74	0	0	+
18-8-36	35 = 4.81	2,200,000	88,500	..	..	..	..	..	..	..	..
21-8-36	36 = 4.95	2,020,000	53,000	9	1	1	16	71	1	1	+
25-8-36	34 = 4.675	2,000,000	57,000	..	..	..	..	..	..	..	..
31-8-36	27 = 3.71	1,710,000	152,000	15	0	36.5	7	41.5	0	0	+
4-9-36	21 = 2.8875	1,310,000	198,000	6.5	0	74	5	14.5	0	0	0
8-9-36	..	..	..	1.5	0	82	6	9.5	0.5	0	..

rise in the total white cell count (see chart I, photomicrographs, plate XIX, and plate XX).

The diarrhœa did not respond to treatment; the temperature rose to 103°F. and the pulse rate to 144 per minute. On 4th September, the patient gradually grew worse and he died on the morning of 9th September. He remained conscious almost to the end. Autopsy was not permitted by the relatives.

*Case 2.*—Indian male, aged 30 years, a school master by occupation, was admitted into the Carimichael Hospital under Dr. J. C. Gupta on 7th July, 1936, complaining of attacks of fever off and on, a feeling of heaviness in the left hypochondrium, general weakness, and attacks of giddiness. The illness started insidiously with a sense of exhaustion following exertion, about one and a half years ago. Then a mass appeared in the left side of the abdomen and he began to get low

After being taken under our charge the deep x-ray exposures were continued. The details of the dosage of the deep x-ray therapy in this case are as follows:—Voltage—190 kilovolts; filter—0.5 mm. of copper and 1 mm. of aluminium; distance—15 inches; milliamperes—3. Between 31st July and 8th September, 1936, the patient had nine deep x-ray exposures, each of ten minutes (about 1/6th pastille dose) and from the 14th to 19th September, 1936, he had four deep x-ray exposures each of 2 minutes 45 seconds' duration (about 1/24th pastille dose).

Under treatment the successive weekly total leucocyte counts were 70,000, 60,000, 53,000, 22,500 and 11,250 per c.mm., and the percentage of myelocytes 9, 8.5, 4.5, 2.5 and 2.0. The total red cell count and the hæmoglobin showed an upward tendency throughout.

The leucocyte count on 6th October was 11,250 per c.mm. and there were only 2 per cent of neutrophilic

PLATE XVIII



The retinae in a case of myeloid leukaemia showing characteristic changes.



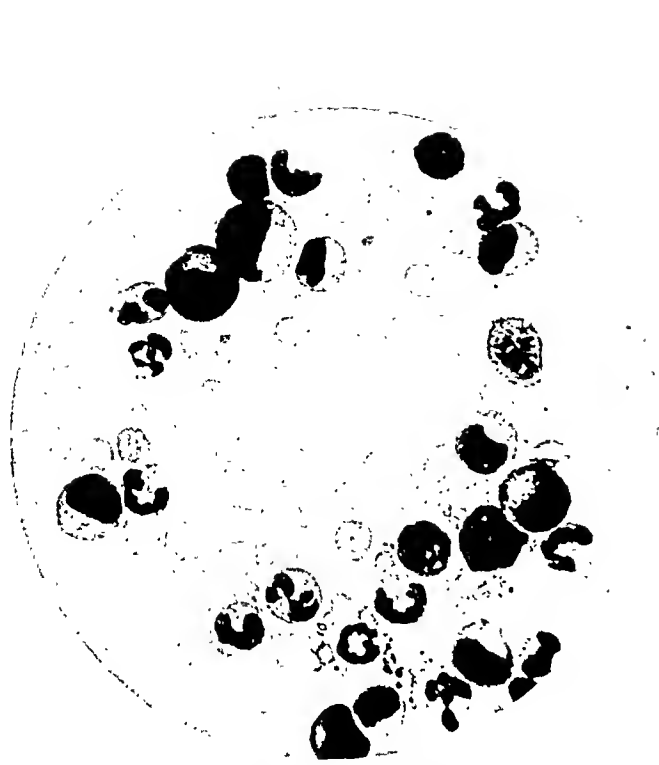


Fig. 1.—Case 1, at time of admission: typical picture of myeloid leukaemia.

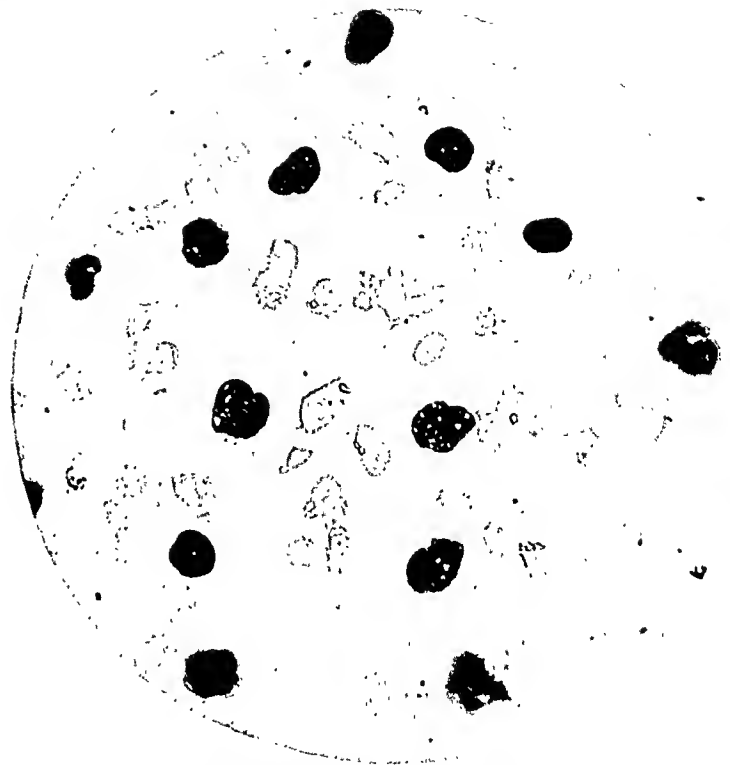


Fig. 2.—Blood picture on 25th August, showing only free nuclei of disintegrated white cells.

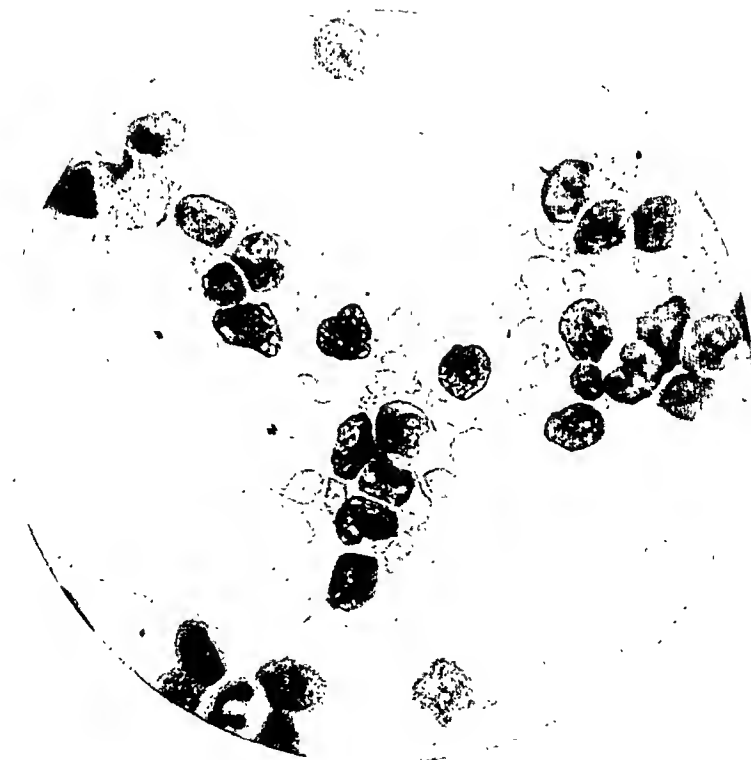


Fig. 3.—Blood picture on 8th September, showing myeloblasts (82 per cent) with only a few more mature white cells.





myelocytes. Otherwise, the differential count was entirely normal. The red cells were about four millions and a half. His general health improved considerably and he gained 11 lbs. in weight during his stay in the hospital. The spleen was just palpable.

When he left hospital his only symptom was a headache and this continued to trouble him off and on.

He reported himself again on 25th March, 1937; he had not been feeling well and had suffered from very severe headaches; he looked ill. His spleen was still just palpable, his red cell count was 4,000,000 per c.mm. and slightly microcytic and hypochromic, his leucocyte count was 14,800 per c.mm. but no myelocytes were found. Despite the slight fall in the number of red cells and slight increase in the leucocytes the blood picture could be considered as improved on account of the absence of myelocytes.

*Case 3.*—An Indian male, aged 31 years, a business man, was admitted into the hospital on 12th August, 1936, complaining of a sense of exhaustion, weakness, progressive enlargement of the spleen, anæmia, and loss of weight. A little over two years ago, he had a severe attack of malaria which was cured by three injections of quinine. Three weeks after this attack of fever he started having low fever, which came on in the evening. He had enlargement of the spleen at the time. His attending physician suspected him to be a case of kala-azar and gave a course of 12 injections of urea stibamine. This had no effect on the fever and the progressive enlargement of the spleen continued. About 21 months ago he also started having frequent attacks of epistaxis which lasted for four to five months, and for the last two years he had had slight bleeding from the gums. He also had an attack of dysentery about five months ago. Soon after this he was admitted into the Belgachia Hospital. There he was given benzol and 12 therapeutic exposures of deep x-ray. As a result of this treatment, there was a slight reduction of the spleen and improvement of the general condition.

In the past, the patient had frequently suffered from malaria.

years). Ophthalmological examination revealed chorio-retinitis with optic atrophy of the right eye.

#### Laboratory findings (other than blood examinations)

Wassermann reaction—moderately positive. Gastric analysis (alcohol test meal)—this showed a fairly normal acid curve but on the low side; the fasting juice and the first eight samples were as follows:—

Free HCl 2, 3, 15, 21, 9, 8, 6, 4 and 2 c.cm. (N/10).

There were no other findings of any importance.

*Treatment.*—Deep x-ray therapy was commenced on 4th September. He received two exposures of 10 minutes on 4th and 8th September. He was then given a small exposure daily of 2 minutes 45 seconds (about 1/24 pastille dose) from 14th September to 2nd October.

He was given a course of bicreol injections (1 c.cm. at one-week intervals).

*Progress.*—For the first three weeks the patient was not given any deep x-ray exposures as he had a leucocyte count of 19,000; on 1st September this had increased to 30,500 and a course of deep x-ray therapy was started.

At first there was a slight increase in the leucocyte count with a slight fall of hæmoglobin and red cells, but with the continuation of treatment the hæmoglobin gradually rose to 11.82 grammes. On 12th October the red cell count rose to 4,150,000 and leucocytes came down to 13,000. Mature neutrophils gradually increased in number. Though the spleen was diminished only slightly (it was four inches below the costal margin and very movable), there was a marked improvement in the general health and during two months' stay in the hospital he gained 15 lbs. in weight.

He remained in hospital until 11th November, when he was discharged. No further x-ray exposures were given. His leucocyte count fell to 9,900 on 19th October when there were still 4 per cent of myelocytes in the count: the leucocyte remained more or less constant until his discharge, but the percentage of myelocytes fell to 1.5. The weekly counts are shown in the table.

TABLE II  
Summary of blood findings in case 3

Date	Hæmoglobin per cent = gm. per 100 c.cm.	Red blood cells per c.mm.	White blood cells per c.mm.	PERCENTAGE DISTRIBUTION OF NUCLEATED CELLS							
				Lymphocytes	Large mononuclears	Myeloblasts	Myelocytes	Polymorphonuclear neutrophils	Eosinophils	Basophils	Nucleated R. B. C.
13-8-36	82 = 11.275	4,050,000	19,000	17	1	2	16	62	1	1	+
1-9-36	86 = 11.825	4,040,000	30,500	12	3.5	1.5	6.5	72.5	4	0	+
8-9-36	78 = 10.725	3,650,000	44,500	7	1	0	5.5	79.5	2	1.5	3.5
18-9-36	83 = 11.4125	4,200,000	26,500	5.5	9	0.5	9.5	70.5	1	1	3
25-9-36	83 = 11.4125	4,180,000	29,700	5.5	5	0	8.5	73	5.5	2	0.5
29-9-36	80 = 11	3,950,000	19,000	3	4.5	1.5	6.5	80	3	1.5	0
5-10-36	88 = 12.1	4,275,000	16,500	4	4.5	0	8.5	78	3.5	0.5	1
12-10-36	86 = 11.825	4,150,000	13,000	7	5	0	8	75.5	3	1	0.5
19-10-36	87 = 11.9625	4,160,000	9,900	9.5	8	0	4	72.5	4.5	1.5	0
24-10-36	92 = 12.65	4,590,000	11,500	11.5	7	0	3.5	77	1	0	0
2-11-36	95 = 13.0625	4,790,000	12,200	7	6.5	0	3	80	3	0.5	0
10-11-36	102 = 14.025	5,130,000	11,000	6	11.5	0	1.5	78	1.5	1	0.5

On admission, the patient was found to be fairly well nourished and slightly anæmic. The spleen was five inches and the liver was two inches below the costal margin. There was no abnormality detected in the heart, lungs, or in the urinary or central nervous systems. There was tenderness over the sternum and the patient complained of marked diminution of vision in the right eye (this had been noticed for many

His weight remained constant and his general state of health good.

*Case 4.*—A Hindu male, aged 30 years, a business man, was admitted on the 1st September, 1936, for irregular intermittent fever with enlargement of the spleen for ten months, weakness and a sense of fatigue on slight exertion for four months and anæmia noticed for two months.

TABLE III  
Summary of blood findings in case 4

Date	Hæmoglobin per cent = gm. per 100 c.cm.	R. B. C. in millions	W. B. C. in thousands	PERCENTAGE DISTRIBUTION OF NUCLEATED CELLS							
				Lymphocytes	Large mononuclears	Myeloblasts	Myelocytes	Polymorphonuclear neutrophils	Eosinophils	Basophils	Nucleated R. B. C.
2-9-36	52 = 7.15	3.54	487	2.5	0	10.5	22.5	60.5	2	2	0
9-9-36	43 = 5.9125	2.7	284.25	1	1	6.5	21	62	2	6.5	1
16-9-36	51 = 7.0125	3.02	298	..	..	..	..	..	..	..	..
23-9-36	59 = 8.1125	3.59	232	0.5	1	11.5	19	54.5	4.5	8.5	0.5
7-10-36	74 = 10.175	4.08	189	..	..	..	..	..	..	..	..
15-10-36	65 = 8.9375	3.9	145	2	2	4.5	19	61.5	4	7	0
21-10-36	64 = 8.8	4.0	131	2.5	1.5	2	10.5	78.5	1.5	3	0
28-10-36	67 = 9.2125	4.14	126.5	2	2.5	1.5	15	71	3.5	3.5	1
4-11-36	77 = 10.58	4.11	99	1.5	1	2.5	8	81	2	4	0
14-11-36	74 = 10.175	4.57	77.5	..	..	..	..	..	..	..	..
24-11-36	81 = 11.1375	4.88	118	2	3	2	14.5	71.5	4.5	2.5	0
30-11-36	84 = 11.55	5.01	108	2	4	3.5	12	73.5	3	2	0
7-12-36	82 = 11.275	4.96	160	2.5	2	4	13.5	71.5	1.5	5	0
14-12-36	82 = 11.275	3.88	125	..	..	..	..	..	..	..	..
21-12-36	85 = 11.6875	4.68	142	3.5	0.5	3	12.5	72.5	2.5	5.5	0
28-12-36	92 = 12.925	5.13	130	..	..	..	..	..	..	..	..
4-1-37	80 = 11	4.9	153	1.5	1	2.5	8.5	76	4	6	0.5
13-1-37	87 = 11.9625	5.07	103	1.5	0.5	1	8	80.5	2.5	7	0
20-1-37	87 = 11.9625	5.1	92.5	..	..	..	..	..	..	..	..
27-1-37	93 = 12.7875	5.54	110	2.5	2	0.5	6	86.5	0.5	2	0
3-2-37	88 = 12.1	4.83	92	1	1.5	1	9	81.5	1.5	4.5	0
10-2-37	75 = 10.3125	4.82	85.5	1.5	1	6	8	80	0.5	2.5	0.5
17-2-37	65 = 8.9375	4.02	85	0.5	1	18	19.5	59	1	1	0
20-2-37	..	..	..	1	1.5	27.5	19	50.5	0.5	0	0
24-2-37	52 = 7.15	2.58	212	1.5	2	25.5	36	32	1	1.5	..

The patients had not suffered from any serious disease except attacks of malarial fever in his childhood (18 years ago) and again ten years ago. He had not had kala-azar nor had he received any antimony injections.

On admission the patient was found to be of thin build and was moderately anæmic. The spleen was enlarged nine inches below the costal margin and was hard. The liver was enlarged three inches below the costal margin. No other abnormality was detected.

*Results of the routine laboratory examinations:*—*Blood count*—see table III. No malarial parasites were found on examination of smears or on culture. *Aldehyde test*—negative. *Van den Bergh indirect*—negative, *Wassermann reaction*—negative. *Blood urea* was 0.012 per cent, *cholesterol*—0.085 per cent and *uric acid*—0.0017 per cent.

Examination of the stools showed the presence of cysts of *Giardia intestinalis* and *Entamæba nana* and on culture *Bacterium carolinus* was found.

*Urine*.—Albumin and sugar—nil, urobilin +, no abnormal findings on microscopic examination.

*Gastric analysis*.—Free acid—6, 4, 12, 16, 4, 0, 0, 0, 0. Total acid—14, 10, 22, 24, 10, 8, 6, 4, 10, 5.

*Sternum puncture*—see table VI.

Treatment by deep x-ray exposures over the spleen was started on the 4th September, 1936. He had the next exposure on the 8th and from the 14th he had five to six exposures every week. The patient had a marked degree of microcytic anæmia; for this he was given a three-weeks' course of ferrous sulphate 18 grs. daily from 12th September to 2nd October, during which period the hæmoglobin improved by about 4 grammes per cent. By the middle of October the fever had subsided, the leucocyte count had fallen from 487,000 to 145,000 per c.mm.; hæmoglobin increased from 5.9 to

8.98 gm. per cent (65 per cent) and the spleen was reduced to seven inches below the costal margin. The deep x-ray therapy was continued and by the 13th November the patient had received 50 exposures. At this period the leucocyte count reached its lowest level (77,500 per c.mm.) and the patient's general health showed fair improvement; he gained 6½ lbs. in weight and the spleen came down by 4½ inches and was softer. The treatment was here interrupted for six days on account of a breakdown of the apparatus and this caused a slight set-back by way of a rise of leucocytes.

The patient's general health continued to improve with the commencement of the deep x-ray therapy again from the 20th November. From this period to the first week of February the patient kept fairly good health. He had no fever, the spleen was reduced to 4½ inches and the liver to 1 inch below the costal margin, and he had gained altogether about 16 lbs. in weight. The leucocyte count had again come down to 92,000 per c.mm.; hæmoglobin was 12 gm. per cent (88 per cent) and red cell count was 4,830,000 per c.mm. The immature cells (myeloblasts, premyelocytes and myelocytes) were only 9 per cent. In all, the patient had 114 deep x-ray exposures.\*

\* The voltage, filter, distance, etc., were the same as in case 2. The patient had exposures of 10 minutes each on 4th and 8th September, 1936. Between 14th September and 22nd December, he had 74 exposures each of 2 minutes 45 seconds; on 23rd December, he had had an exposure of 10 minutes' duration; between 26th December, 1936, and 5th January, 1937, seven exposures of 2 minutes 45 seconds each; on 6th, 7th and 8th January he had exposures of 10 minutes daily. From 9th to 29th January, he had 17 exposures of 2 minutes 45 seconds each and from 30th January to 10th February, 1937, he had 10 exposures of 4 minutes each day.

On the 10th February, 1937, the patient had a sharp rise of temperature with rigor and pain in the body. No malarial parasites were found on repeated examinations, an attack of influenza was suspected and the patient was put on salicylate mixture. The patient was given cinchona from the 13th to the 18th, but this had no effect on the temperature which became a high remittent type of fever. He was having rigors almost daily. The spleen and the liver rapidly enlarged and he had severe pain in the spleen. On 17th February the patient had an attack of diarrhoea. This was checked with pulv. ipecac. co. and bismuth. His general condition was rapidly becoming worse, the leucocytes increased to 212,000 per c.mm. on the 24th and there were 61.5 per cent immature cells. Blood hæmoglobin was only 7.15 gm. per cent (52 per cent) and red blood count only 2,580,000 per c.mm. Blood transfusion was considered advisable and his blood was found to belong to group III. A transfusion was not, however, given because on the day it was arranged (26th February) the patient had collapsed in the morning and the collapse was followed by a severe rigor with temperature rising up to 104.8°F. The patient's general condition rapidly became worse and he died on the 28th February.

Case 5.—A Hindu male, aged 38 years, a cultivator, was admitted into the Carmichael Hospital on the 20th August, 1936, with a history of fever, bodily pains and malaise, for one and a half years; gradual enlargement of the spleen, marked weakness, and loss of weight. The splenic enlargement and asthenia were noticed for one year.

He had been treated as a case of chronic malaria in Gaya, but, as there was no improvement, he was admitted into the hospital attached to the Darbhanga Medical School where the diagnosis of leukæmia was made. While in that hospital he was given benzol by mouth for one month but apparently without any beneficial effect.

Except for several attacks of malaria, he had had no other illness of importance in the past. There was nothing particular in his family history.

On admission, he was found to be thin and anæmic. The spleen was 11½ inches below the costal margin and reached almost to the brim of the pelvis. It was hard and very slightly movable. The liver was enlarged three inches. There was slight tenderness over the sternum. The apex of the heart was in the fourth space half an inch internal to the nipple line. The lungs were normal. Temperature 98.4°F. Pulse—88 per minute. Respiration—24.

Examination of the eyes showed nothing abnormal.

Laboratory findings (other than blood counts)

Blood urea—0.020, uric acid—0.002, and cholesterol—0.092 per cent. Wassermann reaction—negative. Van den Bergh indirect—negative, and a slight increase of urobilin in the urine.

Gastric analysis.—The fasting juice and the first eight post-prandial samples were neutralized by 14, 0, 10, 12, 6, 8, 6, 7, and 5 N/10 NaOH per 100 cm., respectively, that is, the curve was distinctly hypo-acid.

TABLE IV  
Summary of blood findings in case 5

Date	Hæmoglobin in gm. per 100 c.cm.	R. B. C. in millions	W. B. C. in thousands	PERCENTAGE DISTRIBUTION OF NUCLEATED CELLS							Nucleated R. B. C.
				Lymphocytes	Large mononuclears	Myeloblasts	Myelocytes	Polymorphonuclear neutrophils	Eosinophils	Basophils	
21-8-36	66 = 9.075	3.21	135	2	1	3	24	67	3	0	0
31-8-36	64 = 8.8	3.01	109	..	..	..	..	..	..	..	0
7-9-36	69 = 9.49	3.43	78.5	25	3.5	0.5	14	69	1.5	5	0.5
14-9-36	75 = 10.31	3.98	51.5	3	2	0	18.5	67	4	4	0
21-9-36	82 = 11.275	4.16	45	3.5	2	0	7	78.5	5	1	0.5
28-9-36	83 = 11.4125	4.04	36.5	5.5	1	0.5	11	64.5	4	3	0
2-10-36	84 = 11.55	4.87	30.25	6	3.5	0	10	76.5	5.5	4.5	0
6-10-36	85 = 11.6825	4.46	20	3.5	3	0	5	78.5	4	2.5	0
13-10-36	83 = 11.4125	4.12	13	6	1.5	0	3.5	82.5	5	1	0
20-10-36	85 = 11.6825	4.34	11	5	5.5	0	1.5	82.5	3.5	2.5	0
27-10-36	90 = 12.375	4.35	8.5	6	7	0	5.5	77.5	4	1.5	1
3-11-36	91 = 12.5125	4.52	9.6	4	3	0	3	82.5	6.5	4.5	0
16-11-36	92 = 12.65	4.72	13	7.5	3.5	0	4.5	76.5	5	2	0.5
*25-11-36	108 = 14.85	5.07	18	6	1.5	1.5	5	78	5	4	0
1-12-36	94 = 12.925	4.75	21	5.5	2.5	0.5	4	82	8.5	2.5	0
8-12-36	100 = 13.75	5.02	28.5	5	1	0	2.5	81	..	3	0
15-12-36	96 = 13.2	4.67	26.5	4	..	..	..	..	..	..	0
22-12-36	100 = 13.75	4.74	16.5	9	4	0	3	69	10	5	0
29-12-36	100 = 13.75	4.84	14.5	7	3	0	2	74.5	11	3.5	0
5-1-37	101 = 13.88	4.86	10	10	6.5	0	2.5	71.5	9	4	0
11-1-37	99 = 13.6125	4.69	11.5	12.1	5	0	3.5	80	3.5	6	0
18-1-37	102 = 14.02	5.28	12.1	14.4	5	0	4.5	77.5	5.5	2.5	0
25-1-37	99 = 13.6125	4.9	5.01	13	4.5	0	2.5	79	6.5	3	0
1-2-37	106 = 14.575	4.54	4.53	13.9	4.5	0	2.5	78.5	5.5	3.5	0
8-2-37	99 = 13.6125	4.53	4.6	15	3.5	2	0	83.5	4	4.5	0
17-2-37	100 = 13.75	4.6									
24-2-37	103 = 14.16										

\* The patient had an attack of severe diarrhoea on this day with consequent dehydration.

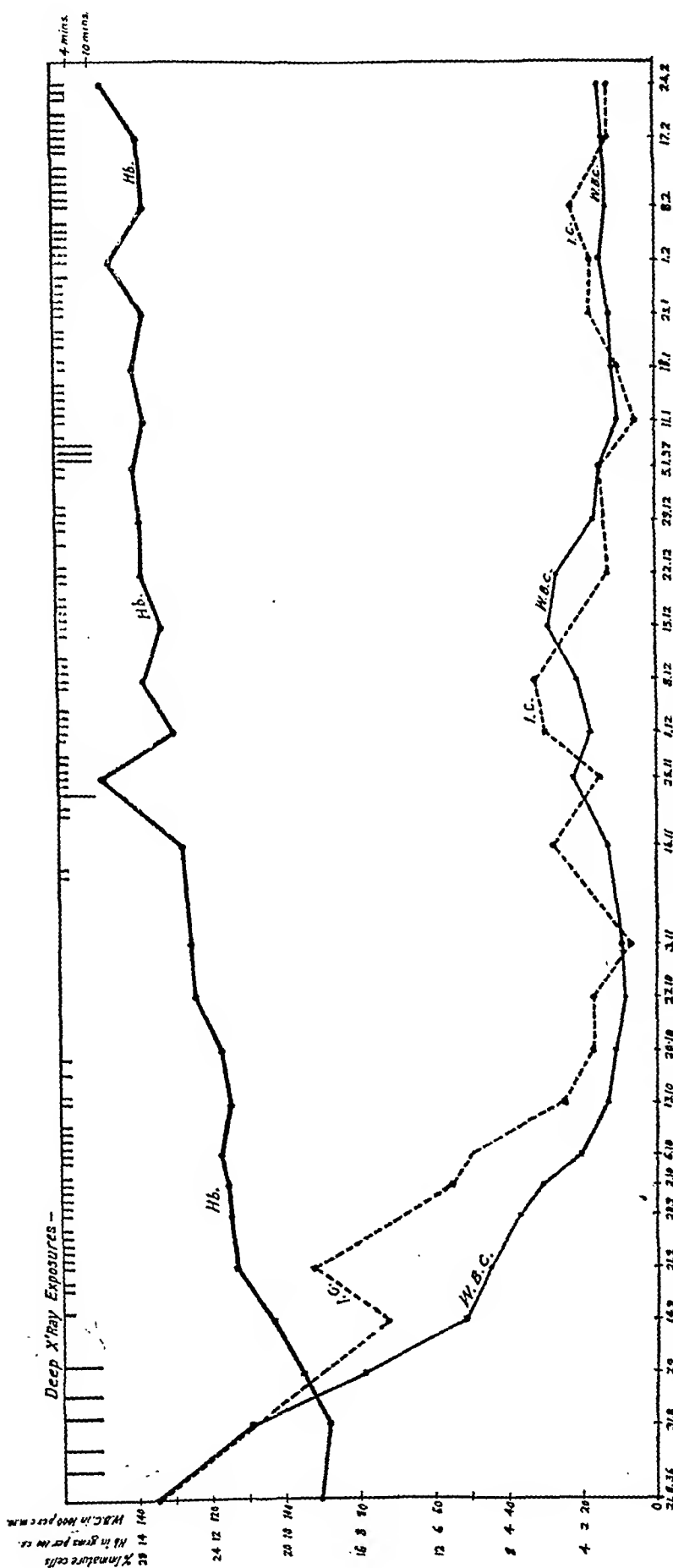


Chart II. Case 5.

**Treatment.**—The tube, voltage, filter, etc., were the same as in case 2. Five deep x-ray exposures of 10 minutes each were given between the 25th August and the 8th September. Then daily small doses (2 minutes 45 seconds) were commenced from the 18th September and continued to the 19th October, up to which time he had had 32 exposures.

**Progress.**—The hæmoglobin and red cell count showed an increase after the fourth exposure and maintained an upward progress throughout the period of observation.

The total leucocyte count showed a marked fall from 135,000 to 109,000 per c.mm. after the second exposure, and decreased throughout the course of treatment and until a week after the end of the first course of treatment, when it reached 8,500. Immature forms decreased and mature forms showed a relative increase.

The spleen showed a marked decrease and was only six inches below the costal margin on 26th September. The patient's weight increased from 115 lbs. on admission to 129 lbs. on 24th November. Here was a corresponding improvement in his general condition.

His general condition was markedly improved, his weight had further increased to 138 lbs. and his spleen was four inches below the costal margin.

**Case 6.**—An Indian male, aged 38 years, a business man, was admitted on 8th October, 1936, with a history of progressive enlargement of the spleen, low fever off and on, and loss of appetite. This illness started about a year ago with the above symptoms, and with pain in the abdomen. Eight months ago he was diagnosed as a case of kala-azar and was given 40 antimony injections (neostibosan and urea stibamine) but this had no effect on the fever nor on the splenic enlargement. About three months ago his blood was examined and a diagnosis of 'myeloid leukæmia' was made. (Leucocytes—225,000 per c.mm., hæmoglobin—50 per cent, myeloblasts and myelocytes present, red blood cells—2,500,000 per c.mm.).

**Past history.**—He suffered from persistent fever for two years with enlargement of the spleen at the age of five years. He had dysentery about the age of 35. There is no history of hæmorrhages.

**Condition on admission.**—The patient was apyrexial. He was sparely built and anæmic. Spleen—5 inches

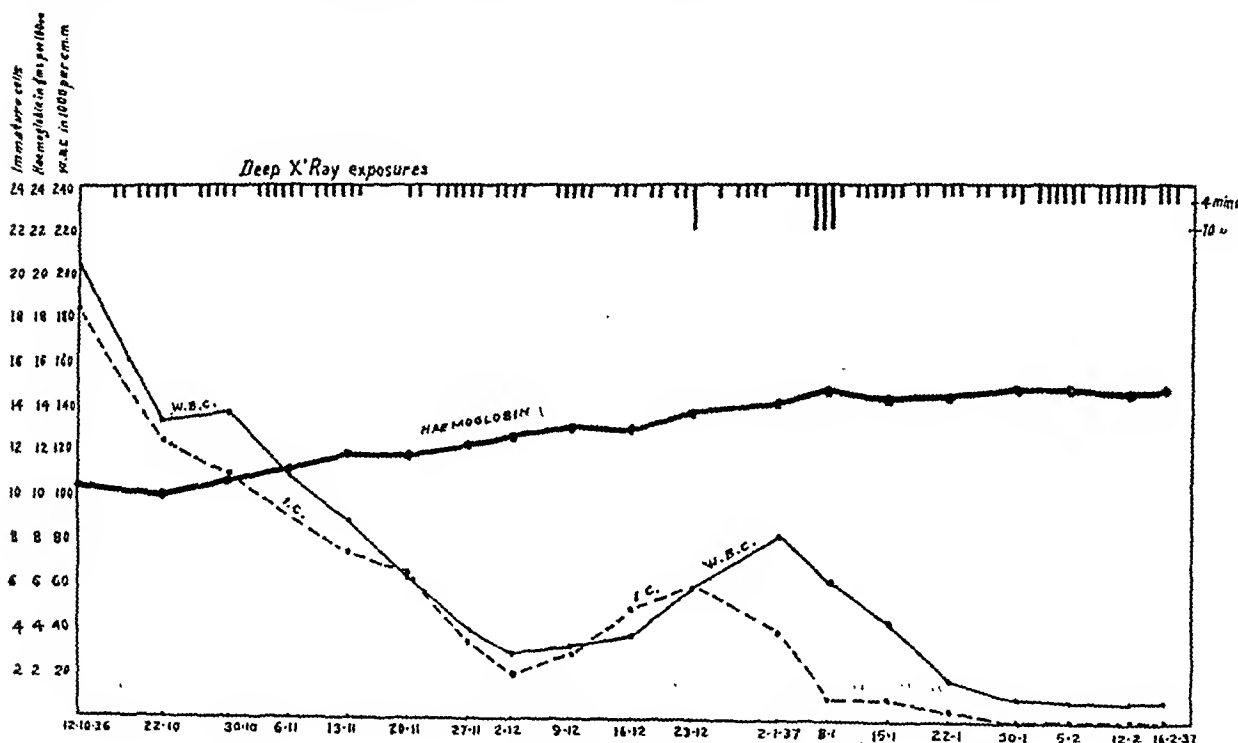


Chart III. Case 6.

Treatment was again commenced on 12th November, but only two exposures were given on account of some disorganization in the electrical department. It was recommenced again on 20th November; small daily doses were again given and continued until 24th February by which time he had had 78 in the second course (110 altogether)\*. After another slight rise in the leucocyte count at the end of November it again fell and reached 10,000 on 11th January.

It remained between 15,000 and 10,000 until he was discharged on 24th February. His hæmoglobin percentage was 14.16 grammes (103 per cent) and red cells 4.6 millions. The myelocytes were 2.5 per cent at the last two counts.

\* Exposures of 2 minutes 45 seconds were given daily up to 29th January, 1937, excepting on the 23rd December, 1936, 6th, 7th and 8th January, 1937, on which days he had exposures of 10 minutes each. From 30th January to 24th February, 1937, the length of the exposures was four minutes daily.

below the costal margin—hard. Liver— $\frac{1}{2}$  inch. Heart—hæmic murmur present. Lungs—nothing abnormal. There was no glandular enlargement. Eyes—normal.

#### Laboratory findings (other than blood counts)

**Stools.**—No ova, protozoa or pathogenic bacteria.

**Urine.**—No sugar or albumin. Urobilin present in slight excess. Aldehyde and antimony tests were negative. Wassermann reaction—negative. Van den Bergh test (indirect)—negative.

Urea—0.12 per cent, uric acid—0.0018 per cent, and cholesterol—0.08 per cent.

The patient was given deep x-ray therapy six days in the week.

**Dosage.**—Deep-therapy lamp—190 kilovolts; 2 minutes 45 seconds at 7.5 inches with 0.5 millimetre copper and 0.5 millimetre aluminium filter. In the course of a month (16th October to 14th November) he had 24 exposures. The leucocytes decreased from 204,000 to 63,500. Hæmoglobin rose from 10.45 g. to 11.82 g. per 100 c.cm. Red cells increased from 4,015,000 to 4,760,000 per c.mm.



Myeloblasts and myelocytes decreased and the mature neutrophils rose from 28.5 per cent to 49 per cent (see also chart III).

The size of the spleen was diminished to two inches and it was found to be softer in consistency. There was an improvement in general health. The patient put on 7 lbs. in weight in the course of a month.

Treatment was interrupted for five days and began again on 20th November and he had 67 exposures up to 16th February when he left hospital. Of these four were 10 minute exposures, the last 16 were 4 minutes and the remainder 2 minutes 45 seconds. His weight increased another two pounds. After falling to 30,000 the white blood count rose again to 83,000 and then again continued to fall until it reached 9,300; it remained more or less constant at this figure until he left hospital. In the last four counts he had no myelocytes. His hæmoglobin percentage increased to 14.85 grammes (108 per cent) and the total red cells to 5.3 millions. His spleen was just palpable. He was also symptom free.

*Ætiology.*—The patients were all Indian males, and they all came from middle-class households where the diet taken was possibly not well balanced but not actually deficient. Their occupations were all different but none was a manual labourer.

The Wassermann reaction was 'strongly' positive in one, 'positive' in one, 'doubtful' in one, and 'negative' in three.

low irregular fever which subsided early in the course of treatment.

The spleen was considerably enlarged in all cases and in those that recovered it became reduced very considerably and was scarcely palpable in cases 2 and 6.

Other symptoms were general weakness and exhaustion on exertion, loss of weight, giddiness and headaches, tinnitus, and swelling of the legs. Except in one case (case 2), in which the headaches and giddiness persisted, all these symptoms disappeared early in the course of treatment.

*The anæmia.*—There was quite definite anæmia in every case. The initial counts are shown in table V. In the patient (case 1) in which the disease ran an acute course there was marked microcytic anæmia ( $MCV = 62.18$  cu.  $\mu$ ). With iron treatment the size of the cells increased but there was a decrease in the number.

In case 4, the other fatal case, there was also microcytic anæmia but with iron treatment the anæmia improved and the improvement was maintained until a month before his death.

TABLE V

*The initial counts showing the degree and nature of the anæmia*

Case number	Date	Hæmoglobin in gm. per 100 c.cm.	Red cells	Cell volume (corrected)	Mean corpuscular volume	Mean corpuscular hæmoglobin	Mean corpuscular hæmoglobin concentration
I	22-7-36	5.087	2,980,000	18.52	62.18	17.07	27.49
II	22-8-36	9.76	3,860,000	35.425	91.7	25.28	27.5
III	18-9-36	11.41	4,200,000	37.59	89.5	27.16	30.1
IV	2-9-36	7.15	3,540,000	21.8	61.5	20.2	32.0
V	21-8-36	9.075	3,210,000	31.61	98.16	28.27	28.71
VI	22-10-36	10.0375	4,150,000	32.7	78.31	24.18	30.9

Four of the six patients had been diagnosed as kala-azar and had received full courses of treatment of one or other of the pentavalent compounds of antimony, for this disease. This fact might be considered important, as suggesting that either kala-azar or the antimony injections were an ætiological factor, except that there is no evidence that there was any justification for this diagnosis in any of the cases; further, we know from experience that antimony is given by many doctors in this province in almost any case of splenomegaly that does not respond to quinine.

The senior writer (Napier and Haldar, 1929) reported a case of temporary leucocythæmia with the presence of myelocytes following kala-azar and antimony treatment, but it is the only case in his experience which includes some thousands of cases treated in hospital.

*The clinical picture.*—Fever was a marked feature in the two fatal cases, though in case 4 the patient was afebrile for some months. In case 3 there was no fever and in the other three

In the other four cases the anæmia was more-or-less normocytic: no iron was given and in each case there was improvement in the anæmia coincident with improvement in the general condition.

*Gastric analysis.*—In the four cases in which this was done, the acid curve was on the low side, and in one the condition could be described as hypochlorhydria.

*Sternum puncture.*—This was done in five cases (table VI). In all there was a marked predominance of leucoblastic over erythroblastic cells; the average percentage of nucleated red cells of total nucleated cells was 6.4, being 16 in one case and 1.5 in another, but there was little correlation between the percentage of nucleated red cells and the degree of the anæmia; in case 3, however, in which the nucleated red cells amounted to 16 per cent, the anæmia was least pronounced and the white count at the time was comparatively low.

In the two fatal cases the percentage of myeloblasts was high, but in the rest it was within the normal range.

TABLE VI  
Spleen puncture before treatment

Case No.	Date	Hæmoglobin in gm. per 100 c.cm.	Red blood cells	Nucleated cells	Reticulo-lyocytes	Megalo-blasts	Erythro-blasts	Normo-blasts	Myelo-blasts	Preny-lyocytes	MYELOCYTES			GRANULOCYTES					Lym-phocytes	Large mono-nuclears
											Neutro.	Eosino.	Baso.	Young	Band	Segment	Eosino-phils	Baso-phils		
1	24-7-36	..	..	120,500	..	0.4	2.2	6.4	18.6	2.6	10.4	0.8	0.2	17.4	27	9.4	0.6	0.2	2.6	1.2
3	25-8-36	11.55	4,300,000	61,500	..	1	8	7	1	0	14	0	0	2	12	41	5	0	7	2
4	2-9-36	6.7375	3,245,000	389,000	1.6	0	0.5	1	12.5	5.5	15	4	1	17	23.5	14	2.5	3	0.5	0
5	26-8-36	7.84	2,695,000	164,000	..	2.5	0	2	5.5	1.5	10	5.5	0	13	24	30.5	3.5	0	1.5	0.5
6	13-10-36	7.56	2,260,000	187,000	1.4	0	0	1.5	1.5	1	4	2	2	28	33.5	12.5	3	8.5	2	0.5

*Spleen punctures.*—Immature cells of the white-cell and red-cell series were seen in large numbers, the proportion of the former to the latter being about 10 to 1. There were few cells from the spleen parenchyma which usually predominate, and practically no lymphocytes. In case 1 there were few myeloblasts although in the sternum puncture these constituted 18 per cent of the nucleated cells.

*Results of treatment.*—Even in the first, the acute case, the deep x-ray therapy produced improvement in the blood picture at first, but the improvement was not maintained. A crisis occurred in which all the granulocytes in circulation appeared to disintegrate. This was followed by a marked increase in the myeloblasts which at one time amounted to 82 per cent of the total leucocytes; except for the presence of a few immature cells of the granulocyte series, the picture might have been mistaken for one of acute lymphatic leukæmia.

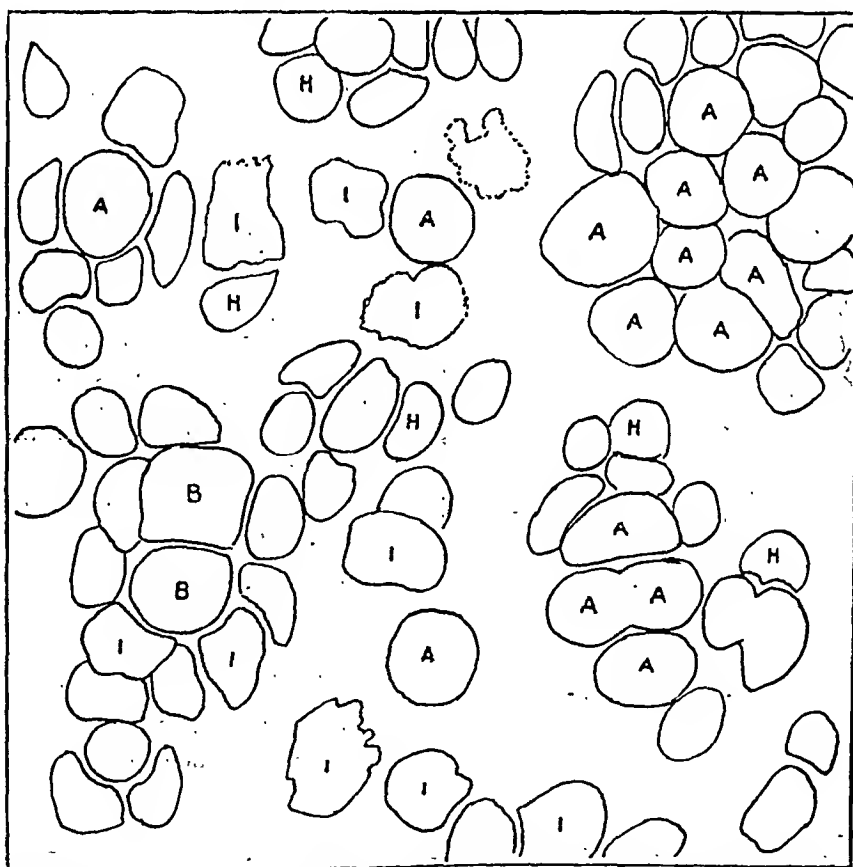
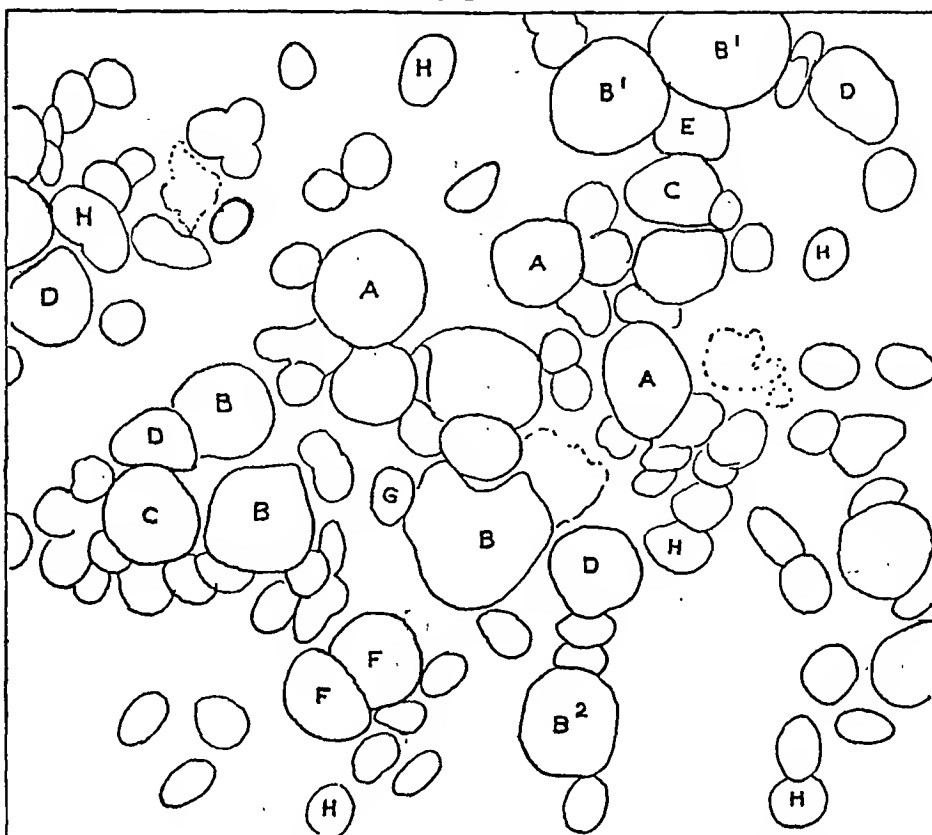
In the other fatal case (case 4) there was also considerable improvement at first, but when treatment was discontinued, even for a short time, there was a tendency to relapse and eventually whilst he was receiving the exposures there was a sudden increase of myeloblasts but not preceded in this case by the disintegration of the more mature granulocytes; this was associated with an increase in the total white cells and a relapse of the clinical condition of the patient. The hæmoglobin percentage continued to improve until the last few weeks and a slight fall in this was taken as an indication for the discontinuance of treatment.

In all the other four cases there was steady improvement which was maintained throughout; this improvement included reduction in the leucocyte count to the more-or-less normal level, the disappearance or reduction to 2 per cent of the immature forms, increase in the hæmoglobin to the normal level, disappearance of fever, marked reduction in splenic enlargement, and disappearance of all other clinical symptoms.

In cases 2 and 3 the treatment was discontinued when the leucocyte level reached about 11,000 as recommended by most workers; Witts and Levitt (1936) mention 15,000. However, in the last two cases we adopted the view that continuation of irradiation could not lower it below the normal level provided irradiation was given to the spleen only. This was justified by the results we obtained, as in both cases 5 and 6 the treatment was continued long after the counts had reached a comparatively low level and no further reduction was effected.

We have discussed only the immediate results of treatment. We are fully aware that temporary remission following treatment is the rule and that relapses always occur. We consider,

## KEY TO PLATE XX



- |     |                        |   |                                 |   |                   |
|-----|------------------------|---|---------------------------------|---|-------------------|
| A   | Myeloblast             | C | Young neutrophilic granulocytes | G | Normoblast        |
| B   | Neutrophilic myelocyte | D | Band form                       | H | Erythrocyte       |
| B'  | Eosinophilic           | E | Segmented                       | I | Nuclear fragments |
| B'' | Basophilic             | F | Basophilic granulocyte          |   |                   |

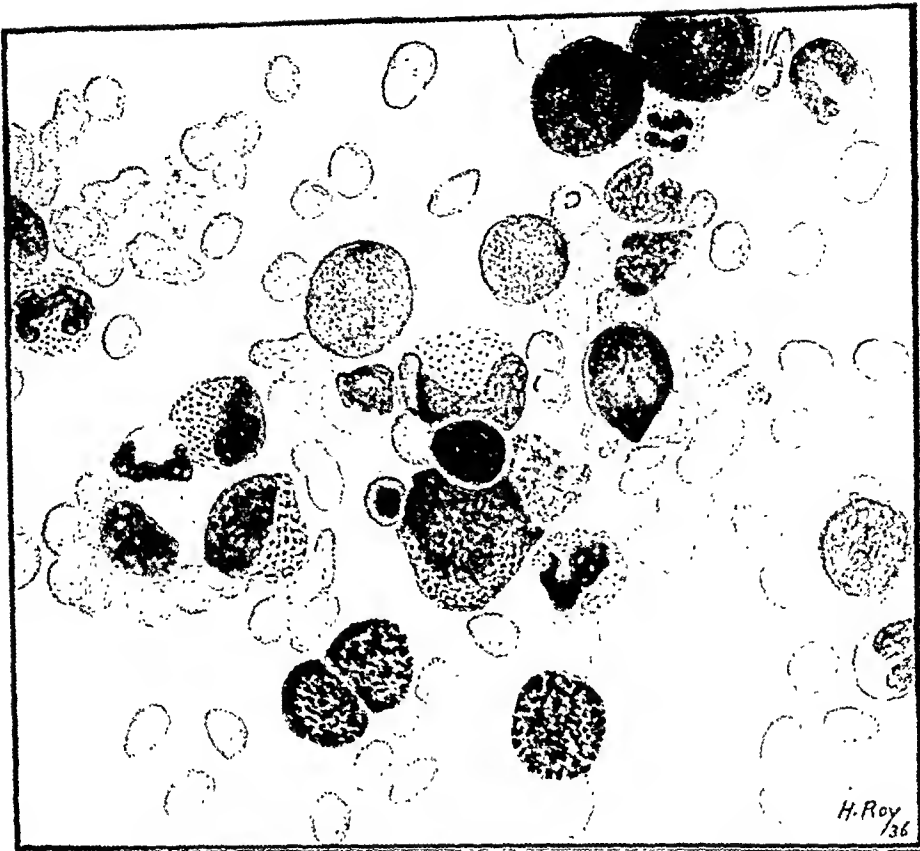


Fig. 1.—Typical blood picture of myeloid leukæmia; from same blood smear as plate XIX, figure 1.

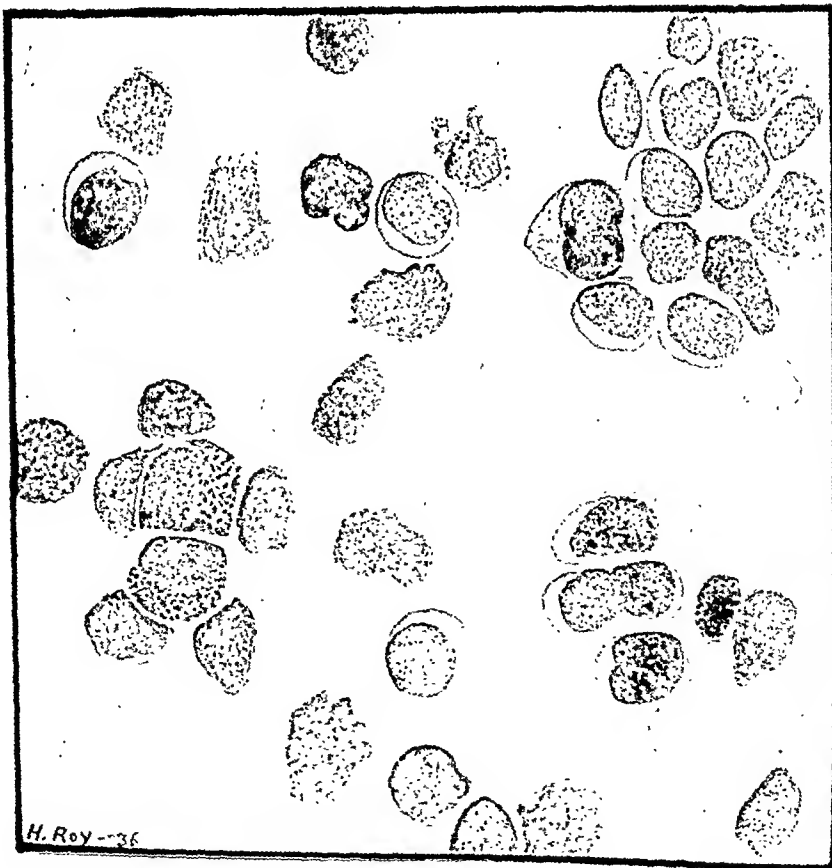
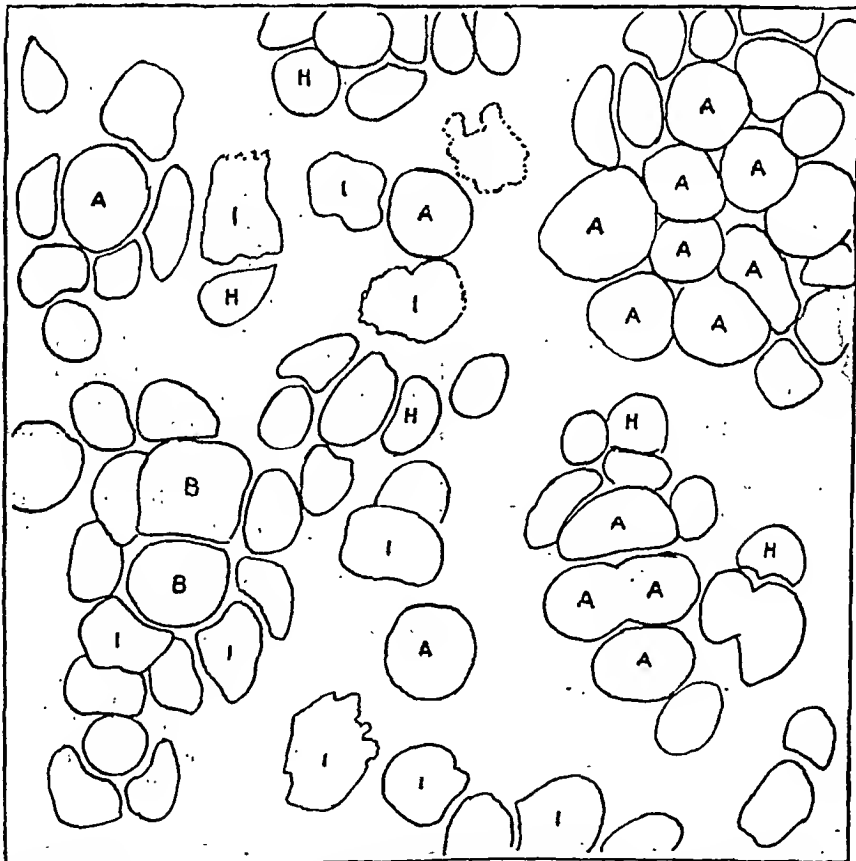
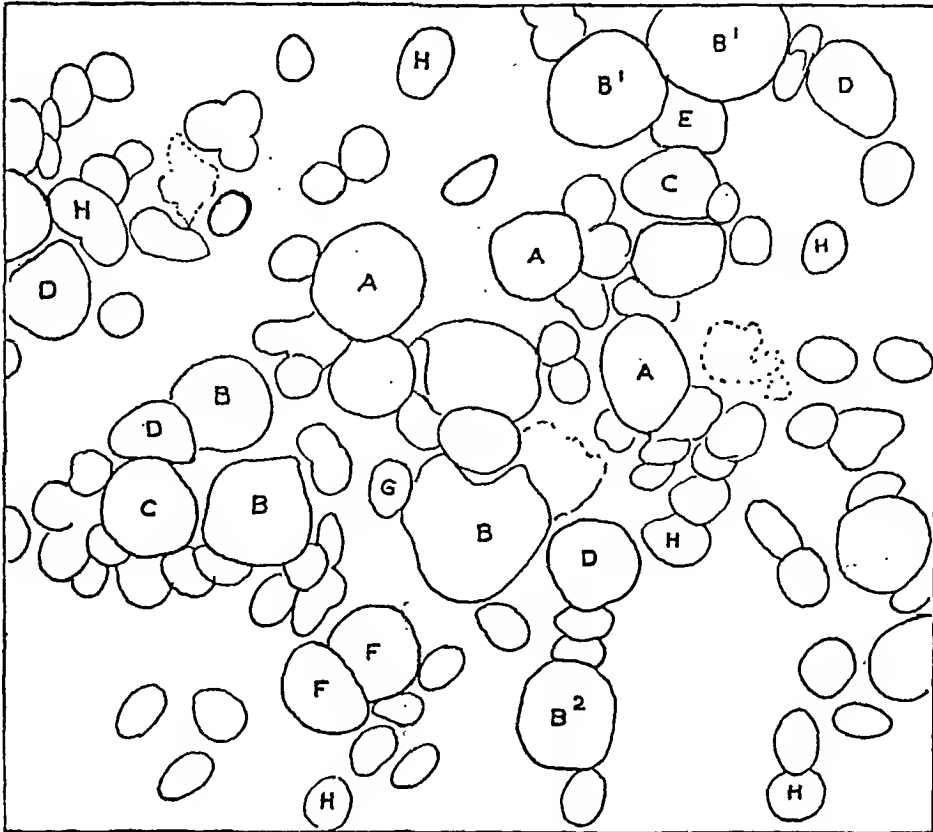


Fig. 2.—Blood smear showing a myeloblastic 'shower'; except for the presence of a few myelocytes the picture is suggestive of lymphatic leukæmia: from same blood smear as plate XIX, figure 3.

## KEY TO PLATE XX



- |     |                        |   |                                 |   |                   |
|-----|------------------------|---|---------------------------------|---|-------------------|
| A   | Myeloblast             | C | Young neutrophilic granulocytes | G | Normoblast        |
| B   | Neutrophilic myelocyte | D | Band form                       | H | Erythrocyte       |
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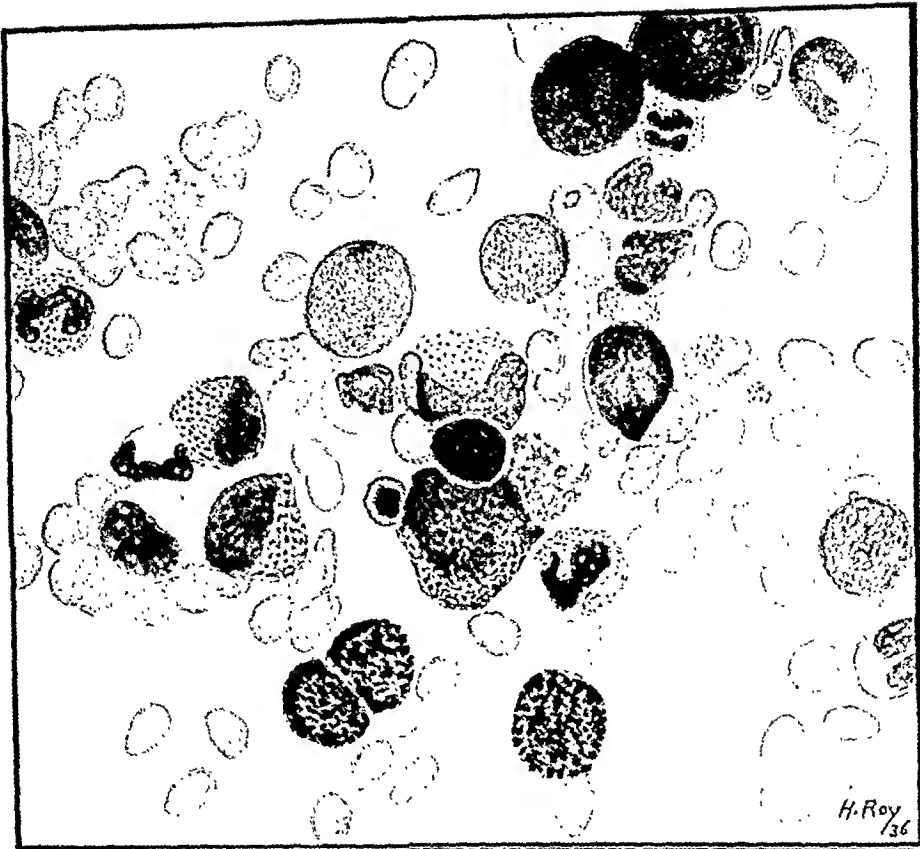


Fig. 1.—Typical blood picture of myeloid leukæmia; from same blood smear as plate XIX, figure 1.



Fig. 2.—Blood smear showing a myeloblastic 'shower'; except for the presence of a few myelocytes the picture is suggestive of lymphatic leukæmia: from same blood smear as plate XIX, figure 3.



of cobra venom, concluded that with dilutions such as 1 in 60,000 to 1 in 80,000 the venom stimulated the growth of the tissue culture cells, while in higher concentrations such as 1 in 20,000 the venom caused the destruction of the growing cells. This action may be explained by the fact that at higher dilutions the formation of fibrin is promoted by the fibrin ferment which promotes the growth or due to the presence of protease which helps in tissue growth. In lower dilutions the fibrinolytic action of the venom is more pronounced and leads to the destruction or at least inhibition of the growth of the tissue.

From the above observations it may be concluded that, in high concentrations and after certain modifications, the cobra venom if injected into the tissues has the power of destroying the cells and particularly the neoplastic cells of the tumours. It may be possible at least to arrest or inhibit their metastatic progress. But to achieve such results the venom will have to be injected locally into the growth so as to come in contact with tissues in high concentrations. The therapeutic dose of cobra venom for man is usually 0.01 mg. to 0.1 mg. (1 to 10 m.u.). This dose when injected would roughly attain a concentration of 1 in 60,000,000 to 1 in 600,000,000 in human blood. At such a low concentration its action would probably be somewhat similar to what Chopra, Das and Mukherjee (*loc. cit.*) found in tissue culture of chicks' embryonic heart cells, *i.e.*, in very high dilutions the venom would stimulate the growth. On the other hand, its destructive action will be only manifest if it is injected in a much higher concentration and only locally into the growth. It has been seen that the therapeutic doses of the venom provoke neither suppuration nor general reaction, but lead to relief of pain and cicatrization and produce other signs of healing.

#### *Action on cardiovascular system*

Chopra and Ishwariah (1931) reported that cobra venom produced an initial rise of blood pressure followed by a fall in experimental cats under chloralose. This action is mainly due to a preliminary stimulation and secondary depression of the vasomotor centres. In the case of Russell viper and Echis viper venom, Chopra and Chowhan (1934 and 1935) reported that the fall of blood pressure is due to the direct action of venom on the circulatory system, particularly on the capillaries, and is similar to that of histamine. Laignel-Lavastine, Warmser and Koréssios (1934) showed that after intravenous injections of 1/100 to 1/50 mg. of cobra venom there was a fall of blood pressure. This effect persisted after double vagotomy and even after an injection of atropine. After injection of the venom even the blood-pressure-raising action of adrenalin is definitely decreased. They therefore came to the conclusion that the action of cobra venom was mainly on the musculature

of the peripheral blood vessels and not through the nervous mechanism.

Gautrelet and Halpern (1934), after a series of experiments on frogs, showed that the action of cobra venom was due to its direct action on the capillaries comparable with that of histamine. When injected intravenously into the ear veins of rabbits, it produced a transient fall of blood pressure. This fall is sometimes preceded by a temporary but transient rise, probably due to the stimulation of sympathetic nerve endings. Beerens and Cuypers (1935) believe that this fall of blood pressure in rabbits is due to a reflex via the nerves of Hering and is independent of parasympathetic nerves.

Méurling (1935) showed that cobra venom also inhibits the action of parasympathetic nerves on the isolated intestines of mammals in dilutions from 1 in 650,000 to 1 in 650,000,000. Electrocardiographic records after injections of cobra venom were variable depending upon the dose, *i.e.*, whether a single non-fatal dose is given or a sublethal dose is repeated daily. The action is of a checking or braking character, leading to retardation of the propagation of the ventricular stimulus and, if the poisoning is severe, to the blocking of the bundle of His. In a normal animal a complete A-V bundle dissociation may occur during the agonal period.

Link (1935) reported that the venom of the Indian cobra has no blood-coagulating principles; this venom in fact destroys the thrombokinase of the blood. The venom of other snakes which have similar action are *Naja flava* and *Sepdon hamochetes*. The venom of *Lachesis atrox* produces an intense lysis of red blood corpuscles and leucocytes in doses of 0.1 to 1 mg., when injected repeatedly. Vellard and Miguelote-Vianna (1935) further showed that there was a decrease of fibrinogen and complement, and an increase in the coagulating power of serum. The hepatic and renal cells may also be damaged. Intramuscular, subcutaneous, intraspinal and intraperitoneal injections of different snake venoms were given to dogs and the blood was taken by cardiac puncture a few minutes before, 12 hours later, and at the time of stoppage of respiration. In all cases they found that there was a very slight reduction of the alkali reserve soon after the injection. In the agonal period this reduction was more marked, particularly in the case of venom of *Naja tripudians* since it acted on the respiratory centre. Chopra, Chowhan and Mukherjee studied the physical changes in the blood of monkeys *in vivo* when cobra venom was injected intramuscularly in doses used therapeutically in man. In such doses the venom produced a lowering of the surface tension, increase of the viscosity of the blood plasma, slight alteration in the pH value and a diminution of the buffer action of the blood after larger doses. There was also a deviation of the electrical changes.

from the normal value but the changes were rather irregular.

#### *Action and uses of cobra venom in nervous conditions*

The present authors (1935) mentioned that the main action of the cobra venom on the nervous system is due to the neurotoxic principle. This principle though present in all snakes preponderates in the venom of Indian cobra (*Naja tripudians*). It has a strong depressant action on vasomotor and the respiratory centres as well as on the neighbouring ganglia. Kellaway and Holden (1932) showed that this venom also has a curara-like action on the motor end-plates. On account of its strong action on the nerve end-organs, it has been advocated in cases of *tic douloureux*. The venom of the krait is reported to have a selective action on the anterior horn cells of the spinal cord. In small doses the venom produces only slight irritation, but, in larger doses or after prolonged contact with the nervous system, it produces paralysis of both the sensory and motor end-organs.

In small doses the cobra venom may therefore be used therapeutically to depress the psychical centres. It has already been mentioned in the literature to be useful in cases of delirium, hallucination, aphasia, melancholia, hysteria, chorea, etc. Being a depressant to the respiratory centre, it may relieve asthmatic attacks. It may be useful in early cases of hemiplegia and paraplegia and other spinal conditions, acting in small doses by stimulating and helping in the regeneration of the nerve tissue.

Cicardo (1935) reports that cobra venom increases the rheo-base and chronaxie of motor nerves before curarization. Muscular chronaxie may be increased. The reflex excitability is reduced before its effect on the motor nerves. The change in the sensory nerves, in the form of summation time, takes place before the changes in the peripheral motor nerves. Macht (1935) demonstrated the analgesic effect of cobra venom in man and guinea-pigs, when injected subcutaneously or intramuscularly. The sensibility to pain produced by electric currents was also greatly diminished and this effect lasted for several hours. Thus he established the claim of the analgesic action of cobra venom in inoperable malignant tumours. Koressios and Negro (1934) reported on the use of snake venoms in cases of tabes dorsalis. The venom of *Lachesis alternatus* has also been used for this purpose. The therapeutic dose for man was the minimum toxic dose on rats, i.e., 0.0375 mg. When administered subcutaneously it did not produce a marked effect but when given intravenously it produced a strong analgesic action. The action of cobra venom in this respect was more powerful.

#### *Cobra venom in eye conditions*

The present authors have shown that instillation of 1 per cent solution of cobra venom into the eyes of rabbits produced, within a few minutes, a marked irritation followed by an acute congestion, lachrymation and oedema of the conjunctiva. With still larger doses the cornea showed signs of ulceration. Zanettin (1936) reported that certain snakes have the power of spitting their venom forcibly into the eyes of their victims even up to a distance of 40 cm. and the senior author saw such cases in East Africa during the war. The venom in contact with the conjunctiva produces severe pain and photophobia, the conjunctiva becomes intensely painful, and the pressure, produced by chemosis in the lower lid and fornix, may lead to necrosis. Bailliant and Koressios (1934) studying the effect of cobra venom on the eye reported that subconjunctival injections produced pain followed by severe congestion, thickening, and adhesions of the iris. Subcutaneous injections of 0.01 to 0.015 mg. in man produced contracted and rigid pupil after 10 to 15 minutes. In some cases there was a slight diminution of the intraocular tension. The arterioles of the fundus appeared to be slightly dilated. In persons suffering from chronic arterial or capillary changes there was first constriction and then a dilatation of the retinal vessels. The therapeutic effect of cobra venom on the eyes is supposed to be due to changes in the blood vessels of the eyes and to fall in general blood pressure. It has been shown that immediately after the injection of cobra venom the acuity of vision was increased within 10 minutes. In the series of 60 cases they have reported, a marked improvement was observed especially in cases of capillaritis and arterial spasm of the retinal blood vessels.

Vernes and Koressios (1934) noticed a vasoconstriction followed by a rapid dilatation of the retinal blood vessels after intramuscular injections of 0.01 to 0.02 mg. of cobra venom. Therapeutically functional improvement is achieved in vascular diseases of the eye, namely, in vascular inflammation. Pollock (1928) used the venom with success in cases of rheumatic iritis.

#### *Cobra venom in new growths*

Koerbler a short time ago reported on the therapeutic uses of cobra venom and the venom of viper ammodytes. In 26 of his patients he gave about 132 injections. All these injections were painless and free from reaction of any sort. There was a marked decrease of pain, so much so that the patients themselves demanded further injections. In metastases from carcinoma of the breast, relief of pain was obtained within 48 hours, but this treatment had no effect on the size of the tumour. In the case of malignant growth of the face, cobra venom in combination with radium produced a more

rapid absorption of the growths and relief of pain than radium alone.

In a paper read before the academy of medicine at Salpêtrière (Paris), Professor Gosset (1933) reported on the therapeutic efficacy of cobra venom. He treated 115 different types of cases of new growth and came to the conclusion that in the majority of cases pain was undoubtedly relieved, but its effect on the growth of the tumours was doubtful. In certain cases a decrease in the metastases of the tumours appeared to occur. The pain due to cancer of the lungs was made bearable, in one case for two years. An important factor in these observations was complete liberation of patients from the use of morphia; there was general improvement in the condition of the patient, the appetite improved, the body-weight increased, and physical and mental activity was enhanced. Laignel-Lavastine and Koressios (1933) reported that a dose of 0.001 mg. of cobra venom, when injected subcutaneously and repeated every eighth or tenth day, relieved remarkably the pains of the malignant tumours in patients who otherwise had to resort to large doses of morphia for their painful symptoms. Macht (1936) treated 105 cases of carcinoma of breast, uterus, rectum, jaw, ovary, tongue and bladder. He started with two to three mouse units and then gave a full dose of five mouse units. Injections were given intramuscularly and repeated daily till relief of pain was obtained. At first an initial small dose was given to see if there was any idiosyncrasy to snake venom and later on the dose was increased. He concluded that in 38 per cent of cases a marked relief of pain was obtained, in 28.6 per cent there was definite amelioration of the symptoms, in 21.9 per cent only slight relief was obtained, in 7 per cent the results were doubtful and in 9 per cent there was no benefit at all. It was observed that the relief of pain was due to the action of the venom on the higher centres, resembling that of morphia, but the treatment did not lead to addiction nor any dangerous after-effect.

The mode of action of cobra venom in new growth may be explained in one of the following ways. Firstly, that it only relieves the pain and pressure symptoms by anaesthetizing the nerve endings due to its specific affinity for certain phosphatide substances present in the nerve cells. It lessens the sensibility of sensory nerves. Secondly, that it has been said to reduce the glycolysis and the pathological processes of oxidation. Thirdly, that it causes cytolysis of the newly-formed cells when it is injected locally in high concentration. This cytolytic action of cobra venom is enhanced when it is heated to 70.0°C.

Although its mode of action is not established and its action on the size of the growth is not determined, it may be safely stated that cobra venom has a marked analgesic action in some

cases and it promises to be a very useful addition for the relief of pain of malignant diseases.

#### *Cobra venom in leprosy and skin diseases*

Ainslie (1826) reported that the dried flesh of a harmless hill snake known as *Tamool* or *Malay Pamboo* has been known to the Hindus as a remedy against 'Kostum' (leprosy). The slough of snakes powdered and mixed with oil of *Dalbergia arborca* has been applied externally in cases of epilepsy and the use of blood of snakes as a local application in cases of leucoderma has been mentioned in the Mohammedan medicine. A preparation of arsenic and dead cobra has been used in northern India in cases of leucoderma and syphilitic rashes. Dutt (1932) also mentions the use of cobra venom in Hindu medicine for leprosy and as an aphrodisiac.

Monaclessor observed that a leper suffering from violent plexus-neuritis was relieved by the bite in the affected area of a large tropical spider. This chance occurrence was the cause of subsequent investigations by Monaclessor and Taguet in Professor Calmette's laboratory in Paris, into the anaesthetic properties of animal poisons, and resulted in the treatment of non-operable tumours with cobra venom. The venom of cobra (*Naja tripudians*) came into prominence because it contains a high proportion of neuro-toxins and only a small quantity of hæmolysin and hæmorrhagin. Labernadie and Branbilla have mentioned the use of cobra venom in neuro-syphilis, meta-syphilitic rashes, and in neuro-leprosy. It is doubtful if the snake venom has any direct action on lepra bacilli or on spironema.

#### *The preparation and standardization of cobra venom for injections*

The injectable venom of Indian cobra was prepared in the Department of Pharmacology of the School of Tropical Medicine, Calcutta, from dried cobra venom, obtained from the Haffkine Institute, Bombay. The fresh scales of Indian cobra venom were kept in a sulphuric acid or calcium chloride desiccator and daily weighed till they gave a weight constant for four days at least. The venom was dissolved in sterile normal saline in concentration of 1 in 10,000 in a sterile flask containing glass beads. The flask had to be shaken constantly for hours to assist the complete solution of the venom. The solution was kept in a refrigerator. It was then filtered through a Seitz filter and filled up into sterile, hard-glass 0.5-c.cm. ampoules. The venom was standardized by injecting this prepared solution in varying doses to different batches of white mice. The maximum tolerated dose of the venom, which does not kill a 20 gm. white mouse within 24 hours, was kept as a standard and was taken as the 'mouse unit'. In the first three batches of 'injectable cobra venom' the mouse unit was

determined by injecting the venom into the dorsal tail vein of the white mouse. But later it was considered that as the venom was used therapeutically by intramuscular method and therefore the mouse unit may also be obtained by injecting the venom intramuscularly instead of intravenously. By this method it was found to be ten times larger than by intravenous route (first three batches). In batches (IV, V and VI) the venom was not sterilized by filtration but was prepared with all aseptic precautions and 0.25 per cent phenol was added to it. With this strength of phenol, the solution was found to be quite free from any contamination with streptococci, staphylococci, gas-forming and spore-forming bacteria after culturing for 24 hours. The venom was filled in rubber-capped amber-coloured vaccine bottles and was stored in a refrigerator. In batches (I, II and III) it was given in doses from 1 to 100 m.u., i.e., 0.1 to 10 m.u. according to later batches, injected once weekly intramuscularly and in the later batches it was used 1-10 m.u. injected bi-weekly. Such doses did not produce any untoward effects on the patients.

The therapeutic dose for man as calculated by mouse units is 0.1 to 0.01 mg. Aeton and Knowles (1914) have shown that the M. L. D. of cobra venom for man is 15 mg. The therapeutic dose of this venom for man is 1/150 to 1/1,500 of the M. L. D.; there is thus a wide range between the lethal and the therapeutic dose and the chances for getting toxic effects are very remote.

#### *Dosage of injectable cobra venom for man*

In our series of cases the usual initial dose was  $\frac{1}{2}$  to 1 m.u. injected twice weekly intramuscularly into the deltoid, biceps, infra-spinatus scapulæ or gluteus muscles. In the case of weak, old and debilitated individuals or children below the age of 12, the initial dose was 1/10 to 1/2 m.u. The subsequent doses were determined by the local and general reaction produced by the previous injections. If any reaction was produced the same dose was repeated or even reduced to half of the previous dose. If there was no reaction the dose was gradually increased by one m.u. every time. After two to four doses the subsequent dose may be given every other day till a dose of 10 m.u. is reached. It has rarely been found necessary to increase the dose beyond 10 m.u. A marked improvement is usually observed after the third or fourth dose. It should however be borne in mind that no two patients react alike and the initial dose and further increase in dosage should be carefully worked out.

According to the other workers the smallest therapeutically active dose for man is 5 m.u. First, six injections 'par distance' are given subcutaneously with intervals of three days between them and then gradually increased to 10 m.u. In some cases the general condition

improved and the diminution of pain occurred after two to four doses. Sometimes, as many as 12 injections are needed before any results are achieved. The dose must be increased very slowly and the smallest possible quantity of venom must always be used. The dose need not be increased as long as the smaller dose is showing beneficial effects. Once the relief of pain is achieved the intervals between the subsequent doses may be prolonged to two to three weeks between injections but the minimum dose should be continued sometimes for as long as three to four months. An entire discontinuation of the treatment is never advisable, not even if the treatment lasts for years.

It has been mentioned above that the lytic properties of cobra venom may be purely local, particularly after it has undergone certain chemical changes on being exposed to a certain temperature. In cases of tumour, a number of injections given locally into the growth, 2 or 3 cm. apart or infiltration of the tissue around the tumour by giving 2 m.u. every three days, may produce beneficial results. Two m.u. can be made sufficient for four to five peri-tumoral injections by diluting it with 1.5 c.cm. physiological salt solution and may be repeated every three days. The present authors claim very little experience in this. Two cases were treated by local injection of the venom, but the course of treatment had to be changed to general injections as in one case it increased the tension of the growth and made it very painful. In another case where both the local and general injections were given the growth showed a marked reduction of size and there was an amelioration of symptoms. It is difficult in this case, in particular, to say whether the main effect was due to local or general injections. The third case of parotid tumour was not considered safe to be injected locally. Injections of less than 10 m.u. are practically painless and cause no general shock nor local inflammation. Higher doses sometimes give rise to local and mild general symptoms.

#### *Reactions*

The local reactions are sometimes produced in the form of inflammation, itching and swelling. The swelling may be diffuse in the form of an erythematous patch or only it may be localized in the form of a hard and painful lump. With large doses (10 m.u.) there may be sometimes even a hæmatoma at the site of injections. In rare cases there may be a generalized reaction in the form of malaise, slight temperature, giddiness, nausea and even diarrhœa. In some cases there is temporary respiratory distress. In others there was an increase of the original symptoms or there may be a feeling of sleepiness immediately after the injection followed by deep refreshing sleep lasting for four to six hours, from which the patient gets up absolutely refreshed with no ill effects. A temporary

increase of local symptoms was taken by us as a reaction in favour of the patient. A few patients report a general sense of euphoria and return of sexual power.

To avoid these proteotoxic or non-specific toxic properties of the snake venom, Simonin and Brion (1935) tried to attenuate and purify the cobra venom before using it for therapeutic purposes. Since the different snake venoms vary in the amount of neurotoxin and other active principles, the rate and intensity of reactions of snake venom will depend upon its freshness, the method of preparation, and the standardization; hence the local and general reactions produced are variable with different batches of preparations from different venoms or even with different batches of the same venom.

### Cases treated

We now propose to briefly describe some cases representing different conditions in which cobra venom was tried.

#### Group I. Patients suffering from vague and indefinite symptoms

**Case 1.**—N. N., a Hindu male, aged 32 years, was admitted to the Carmichael Hospital for Tropical Diseases on 19th August, 1935, with a history of attacks of precordial pain off and on for seven years. Physical examination revealed slight enlargement of the heart, the first sound was short and weak and the second sound was somewhat accentuated; blood pressure 95/65; electrocardiographic examination revealed an auricular flutter with excitation waves of about 560 per minute. The patient complained of a peculiar, indefinite pain on the left side of the chest. Sometimes the patient gave the impression of being neurotic, but he seemed to be in genuine distress most of the time. Although the patient received treatment for the cardiac condition his pain was not relieved. He was then given injections of cobra venom beginning with 1/10 and gradually increased to 10 m.u. intramuscularly twice weekly. The precordial pain and the subjective sensations were considerably relieved after the second injection and after six injections there was no further recurrence.

**Case 2.**—E. H. P., Anglo-Indian male, an engineer, aged 36 years. In May 1935 he injured his skull in a motor accident and was treated in the Presidency General Hospital. A short time after he developed severe headache and on x-ray and transillumination examination a fracture of frontal bones and suppuration in the left frontal and sphenoidal sinuses were discovered. Large amount of pus was evacuated by operation and drainage through the nose was established. A month later he developed signs of meningitis which was confirmed by lumbar puncture; later he developed maniacal symptoms. The patient complained of constant pains all over the body but particularly at the level of 5th and 6th dorsal vertebrae and also in the back of the left thigh and left calf muscles. Pins and needle sensations were felt on the sole of the left foot. He felt as if he was walking over thick felt and he was unable to walk more than 150 yards and had practically become bed-ridden. The Wassermann reaction was negative. He was given two courses of induced malaria therapy but with no improvement.

The cobra venom injections were started on the 24th of September 1936. He was given 20 injections, the highest dose reached being 20 m.u. After each injection he got a feeling of delightful soothing sensation and sleepiness and kept yawning. He would sleep for a few hours after each injection and would get up rather listless and dull. After the second injection (2 m.u.)

he felt a temporary deadening of sensation at the site of injection, which passed on to the fingers of the same hand. Six hours after the second dose the pain in the calf and thighs began to decrease gradually. A slight reduction in the tingling and woolly sensation in the soles of feet was also observed but this lasted only for 24 hours after the injection. After the third injection there was almost a complete disappearance of all pains except those in the spine. The sensation of wooliness in the feet disappeared entirely. There was also a steady increase in his body-weight, appetite; sexual desire and general sense of well-being. He became fit to attend to his daily routine of work and was able to walk two to three miles without any inconvenience.

**Case 3.**—W. A., a European male, aged 46 years, was admitted into the hospital on the 16th June, 1936, complaining of vague pain over the mid-dorsal spine, loins and both calves, off and on for about four years. The pain had been rather severe for about a week and extended down to the heels before admission. Examination of these parts did not reveal any local tenderness. Paræsthetic patches in form of pins-and-needles sensations and burning pains were present over the back, left calf and left tendo achillis. Stools showed the presence of scanty *Entamoeba histolytica* cysts. Wassermann reaction negative. Blood pressure 160/100. Blood urea, non-protein nitrogen and adrenalin function test were normal. Skiagram of teeth showed apical infection of the upper first premolar. He was given a course of carbarsone 0.25 gm., b.d., for 15 days.

Cobra venom injections, bi-weekly, were started on 1st July, and during the first two injections there was an initial increase of the pain. Subsequently after each injection the patient used to fall into a deep sleep for two to three hours and then get up much relieved of pain. After the third and fourth injections of cobra venom the pains completely subsided and the patient was discharged cured after six injections of the venom.

**Case 4.**—R. D., a Hindu male, aged 30 years, was admitted on 23rd December, 1935, complaining of neuralgic pain in both legs for three years. Cutaneous sensations were normal. The knee jerks were slightly exaggerated. Culture of stool showed the presence of *S. morgani* of which an autovaccine was prepared and he was given four injections bi-weekly. Wassermann reaction was positive. Cobra venom was given in doses of 0.1, 0.2, 0.5, 1, 5, and 10 m.u. The patient felt a considerable relief of pain after the third dose of venom. He was discharged with instructions to attend the outpatient department if the pain recurred.

**Case 5.**—R. N. R., a Hindu male, aged 29 years, was admitted to the hospital on the 12th February, 1936, complaining of constant shifting pain in different parts of the body particularly over the neck, shoulders and along the spine during the last three years. No abnormality was detected on physical examination or in the blood, urine or stools. The pain was probably rheumatic in nature. Cobra venom was given intramuscularly bi-weekly in doses of 0.1, 0.5, 0.7, 1, 3, 5, 7, 10 and 10 m.u. He was discharged on 27th February considerably relieved.

**Case 6.**—G. S. S., a Hindu male, aged 50 years, was admitted on 10th September, 1936. He complained of persistent pain along the course of right radial and median nerves extending as far as the dorsum of the right hand. The pain had been coming off and on for the last five years. He had been treated with salicylates, liniments and novalgin injections with no marked relief. On examination his throat and tonsils were found to be septic for which he was given treatment. He was put on cobra venom therapy and received in all eight injections, the maximum dose reached being 8 m.u. He reported a complete relief of pain after the fourth injection. After the completion of injections he was advised to report again if the pain recurred but has not so far complained of any pain.

**Case 7.**—S. G., a Hindu male, aged 40 years, was admitted to the hospital on 1st June, 1936, complaining of pain in the left buttock. The pain radiated all along the course of the sciatic nerve which was tender on deep pressure. His stools showed the presence of vegetative



forms of *Entamoeba histolytica* for which he was given a ten-day course of carbarsone. Paradic current, salicylate ionization and infra-red rays did not give him much relief. He was given ten injections of cobra venom every alternate day, the maximum dose being 10 m.u. The injections were discontinued as he obtained no relief.

Case 8.—G. K., a Hindu male, aged 40 years, was admitted to the hospital on 8th February, 1936, complaining of pain in the right buttock, thigh and leg, duration five months. Pain usually increased at night and particularly after exertion. There was no pain on pressure but it was felt in the buttock and right leg whenever he bent forward or whenever he flexed his leg on the abdomen. There was a history of dysentery 14 years ago. The stools showed the presence of hookworm. He was diagnosed as a case of sciatica and injections of cobra venom were started on 9th February. He received six injections in doses of 0.1, 0.5, 1, 2, 3 and 5 m.u. and reported a good deal of improvement and relief of pain.

Case 9.—D. R. S., a Hindu male, aged 30 years, came on 29th July, 1936, with pains and stiffness of the neck and shoulder muscles for the past three months. The pain started suddenly and there was no history of trauma. He had been already treated with salicylates, analgesic liniments and sodium salicylate ionization but with no marked relief. He was given seven injections of cobra venom which relieved his symptoms by 80 per cent.

## Group II. Patients suffering from nerve type of leprosy

Case 10.—J. K. C., a Hindu male, aged 40 years, came under observation in the hospital with complaint of partial loss of sensation on the dorsum of left foot for about three years. He also complained of pain in the upper left extremity for eight months. He was diagnosed as a case of leprosy of the nerve type. For the relief of pain he was given a course of 16 injections of cobra venom. After ten doses he reported that the pain had almost completely disappeared and there was a good deal of general improvement in his health. Another course of six bi-weekly injections were given to him. He felt much relieved after the completion of his course.

Case 11.—S. C. G., a Hindu male, aged 55 years, noticed extensive erythematous patches on the left cheek, left breast and the back for 26 years. Neuralgic pains first started in left arm and later on extended to his right arm as well. Deformities and swelling of the fingers and toes developed since five years. Shooting pains were more or less constantly present in the lower extremities. During examination he had foot-drop, ulcerated toes, deformities of fingers, shooting pains in lower limbs and hyperaesthesia of skin of legs. Liver and spleen were enlarged. There was absence of heat, cold and pin-prick sensation over the arm and below the knees. Tendon jerks were absent. The case was diagnosed as nerve leprosy. He was given 20 injections of cobra venom intramuscularly at weekly intervals, the maximum dose reached being 10 m.u. There was a distinct relief of pain after the fifth injection and after the course the erythematous patches disappeared.

Case 12.—A. P. C., a Hindu male, aged 64 years, came to the leprosy outpatients' department of the School of Tropical Medicine, Calcutta, on 2nd August, 1935, with erythema and thickening of the face and ears, burning and tingling sensations in both legs and feet, back of elbows and the inner half of the dorsum of both hands, duration one year. The ulnar and peroneal nerves were found to be thickened and there were atrophic ulcers along the lobe of ear and scrapings from the mucous membrane of nose showed lepra bacilli. Kahn's test was positive. Wassermann reaction was strongly positive. He was diagnosed as a case of cutaneous leprosy. He was given the usual treatment of leprosy from 2nd August to 19th September, 1936, with

no marked relief in tingling and burning sensations. Bi-weekly injections of cobra venom were started on 19th September. He received in all eight injections. After the third (3 m.u.) dose the patient reported a slight increase in pain. The venom injections were suspended temporarily for two months and were commenced again starting with 3 m.u. After the fifth injection there was a slight relief of pain and tingling sensations. Four more injections of 5 m.u. each were given. After this course there remained only a slight discomfort in walking while the burning and tingling sensations were very much relieved.

Case 13.—M. D., a Hindu male, aged 48 years, came to the leprosy outpatients' department on 19th July, 1935, with extensive depigmented patches on the lower extremities, arms and dorsal surface of both hands and lightning pains and constant burning and tingling. The ulnar and peroneal nerves were thickened. Nasal scraping and other tests were negative for leprosy. He was given the routine leprosy treatment till 19th August, 1936, without relief of these symptoms. The cobra venom injections were started on 20th August, 1936. There was a slight relief of symptoms after the second dose. After six doses pain was relieved by about 50 per cent. The normal saline injections were then given as a placebo but without any relief to pain. Cobra venom injections were commenced again on 10th November, and he was given eight injections from 1 to 8 m.u. After this course he reported that the pains were relieved to about three-quarters of the original and practically no tingling sensations were left.

Case 14.—N. K. B., a Hindu male, aged 54 years, came to the leprosy outpatients' department on 26th July, 1935, for treatment. He noticed a small depigmented patch on the left hand which gradually became anæsthetic and erythematous. After a few days several anæsthetic patches appeared on different parts of the body and extremities, duration six months. Nasal scrapings were negative, scrapings from the erythematous patches showed lepra bacilli. Wassermann reaction slightly positive, Kahn's test positive, sedimentation test—24.0. He was diagnosed as a case of nerve leprosy. He was given usual leprosy treatment till 26th September. He was given 15 injections of cobra venom in doses of 1 m.u. to 8 m.u. After the fourth injection he reported a great relief of pain and tingling sensations in the extremities. The pain was reduced to about half after the sixth dose and after the fifteenth dose he reported that the relief of pain was about three-quarters of the original. Half-way between this treatment a few injections of normal saline were given. As long as the saline treatment was continued no relief was reported. This showed that the relief with cobra venom was not merely suggestive.

Case 15.—E. M., a Mohammedan male, aged 25 years, came to the outpatients' department on 28th August, 1936, with a history of a tender hyperaesthetic patch on the neck for one year, followed later on by several other similar patches all over the body. He also complained of tingling sensations in the wrist and dorsal and lateral aspects of his right hand and hyperaesthetic patches on the posterior aspects of the left leg and heel. The affected nerves were thickened and tender. He was put on cobra venom treatment on 5th September. There was a good deal of relief of his symptoms after the fifth injection.

## Group III. Patients suffering from new growths

Case 16.—M. N. C., a Hindu male, aged 65 years, developed a small papule on the tongue 11 years ago and since last four years he has been diagnosed as a case of epithelioma of the tongue. The growth on the tongue and infiltration in the glands were fairly well advanced and the pain was severe. He had already had two courses of treatment with radium but without much relief. A series of 16 injections of the venom were given which relieved his pains to a great extent. After the fourth dose the patient reported that the



pain was relieved about 75 per cent. The injections were continued for two months and the progress regarding the relief of pain was very marked. The salivation and suppuration stopped and there was no foul smell from his mouth. The initial dose was very small and the subsequent doses were gradually increased as the patient was very weak and well advanced in age, and the highest dose reached was not more than 8 m.u. The treatment had to be stopped finally on account of bleeding and ulceration of the growth.

**Case 17.**—S. A. H., a Mohammedan male, aged 60 years, a doctor, came for treatment on 22nd January, 1937. Since two years he has been suffering from pain in the throat. In September 1935 a fissure in the pharynx, at the level of epiglottis, was noticed. It was cauterized in the Medical College, Patna, and throat paints were regularly applied. He gave a history of bleeding from the throat 20 years ago. On examination a hard nodule was seen at the back of the throat at the original site of fissure. The nodule was very painful to touch and no drug relieved his pain and he was unable to sleep. He was diagnosed as an early case of carcinoma of the pharynx. He had eight deep x-ray exposures at Patna which relieved his pain for about a year. He had also received about 30 more deep x-ray exposures recently at Calcutta but with no relief. Cobra venom injections were started from 0.5 m.u. and were increased by 1 m.u. every other day. He received six injections when he felt a slight relief of pain and after the third dose the pain was so much relieved that he could swallow his food and sleep without any pain. He was given 10 more injections in doses of 5 to 20 m.u. After completion of this course he reported that there was no pain in the throat during swallowing though the growth was still felt.

**Case 18.**—M. C. C., a Hindu male, aged 70 years, a homeopathic doctor, came for treatment on 21st December, 1936. He complained of pain and bleeding from the throat for seven years and hoarseness of voice for four months. Examination of the throat eight months before admission showed the presence of an ulcer on the left ary-epiglottic fold and swelling in the pyriform fossæ and carcinoma of larynx was suspected. Wassermann reaction was weakly positive. He received ten deep x-ray exposures in the Medical College Hospital. Since then he has had no bleeding from the throat nor difficulty in swallowing but slight pain at the site and hoarseness of voice persisted without any improvement of the ulcer. The cobra venom injections were started on 21st December, 1936, the initial dose being 0.25 m.u. The dose was gradually increased every third day. There was marked relief of pain after the fourth dose. On re-examination in the ear, nose, and throat department it was reported that there was a slight improvement in the ulceration and improvement in his voice. The injections of venom were continued. On 16th February, 1937, he was examined again. It was reported that there was no trace of the original ulcer. He had received altogether 25 injections. The maximum dose reached was 10 m.u. His blood was tested again and found to be negative to Wassermann reaction.

#### Group IV. Patients who were found sensitive to cobra venom

**Case 19.**—W. B. D., a European male, aged 50 years, was suffering from symptoms of tabes dorsalis. He was admitted to the hospital on 26th October, 1936, with a feeling of a cord tied around the great and second toes of both feet of eight months' duration. This sensation was gradually working upwards. At the time of admission he also had hyperæsthesia of chest, legs and hands. The patient was given malaria therapy on several occasions without any marked improvement. On 9th November, 1936, he was given 0.5 m.u. of cobra venom intramuscularly and this was followed by a rise of temperature to 101°F. He was given two more injections of 1 and 1.5 m.u. at three-day intervals, but after these injections he reported that his symptoms were greatly exaggerated and that he could not sleep at all. The treatment had to be discontinued because

this patient appeared to be hypersensitive to the cobra venom.

**Case 20.**—D. B., an Anglo-Indian female nurse, aged 39 years, was admitted to the hospital on 26th August, 1936, complaining of severe backache, particularly in the lumbar region, duration 11 days. The back was tender to deep pressure and the pain was aggravated on exertion and relieved after rest. On examination the stools showed scanty cystic and vegetative forms of *E. histolytica* and *E. nana*. Almost all the teeth had infected roots.

She was put on carbarsone 0.25 grm. twice daily for 15 days along with salicylate ionization, belladonna plaster, infra-red rays and novalgin tablets. On 29th August 1 m.u. of cobra venom was injected intramuscularly. The patient complained that her pain became very intense 15 minutes after the injection. She felt as if her limbs were paralysed and she was unable to lift her limbs or head. The pain became so bad that she could not sleep the whole night and had a slight rise of temperature. Two days later the same dose was repeated and she experienced the same symptoms. The third dose of cobra venom was reduced to 0.25 m.u. This time as well, the exaggeration of pain and the paralytic symptoms were felt as usual and the cobra venom treatment had to be given up as she proved to be very sensitive.

**Case 21.**—B. B., a Mohammedan female, aged 45 years, came to this hospital for treatment on 3rd October, 1936. For about a month she noticed an erythematous patch on the left hand after a slight fever. The patch has since then increased in size and become anæsthetic. All nerves of the affected limb were thickened and tender. Kahn's test was positive. Sedimentation test—38.0. The case was diagnosed as neuro-leprosy. She was put on cobra venom treatment straight off on 7th October, 1936. She received six injections up to a maximum dose of 4 m.u. There was no relief of pain but after each injection there was a local reaction and fever. The case appeared to be hypersensitive to cobra venom since whenever an injection was given there was a marked reaction.

These cases appeared to be very sensitive to the injections of cobra venom. Such cases have been mentioned in the literature.

#### Group V. Patients with chronic nerve lesions in form of paraplegia and paralysis of the muscles

**Case 22.**—Y., a Mohammedan male, aged 30 years, a beggar, was admitted to this hospital on 17th September, 1936, with spastic paraplegia after an attack of lathyrism six years ago. On one rainy day he suddenly got a severe attack of pains in his legs while he was working in a paddy field in water. Later on he developed the symptoms of lathyrism. He gave a history of eating *khesari dal* for a long time, before the attack. On examination both his lower extremities were seen to be very much emaciated. The knee jerks were exaggerated and the ankle clonus was marked. The blood and cerebro-spinal fluid were negative to Wassermann reaction. He was given 17 intramuscular injections of cobra venom bi-weekly, up to a maximum dose of 15 m.u. No improvement was noticed in the spasticity of the lower limbs and there was no change in the electrical response of the muscles; this was probably due to a permanent damage having been done to the nerves supplying the muscles of the affected limbs.

**Case 23.**—S. P., an Anglo-Indian male, aged 65 years, was admitted into this hospital on 25th January, 1937, with completely paralysed right leg. The limb was cold to the touch and tender along the course of the tibial nerve. In June 1934, he had a sudden attack of fever and shooting pain in the back. Three days later his right leg was completely paralysed. He had all along been treated in the Medical College with faradic current, massage, and antisyphilitic treatment with no marked improvement. The knee jerks were absent,

sensations to touch, pain and temperature were intact and normal. He was unable to walk or even support his weight on the affected limb without crutches. The reaction of degeneration was present in all the muscles of the affected limb. Cobra venom injections were started on 27th January, 1937. The maximum dose (20 m.u.) was reached on 20th February and was maintained to the end. After the second dose he reported that his limb was warm and the tenderness of the tibial nerve was reduced. Deep x-ray exposures to the lumbar region of the spine and galvanic current to the affected limb was started on 8th February. The patient has been in the hospital for over two months and during this period a marked improvement of the affected nerves and muscles of that leg were noticed. Though a mixed sort of treatment was given the patient showed a definite improvement.

The former case in this group did not show any improvement at all, but the latter one had a good deal of improvement in the paralysed limb in the form of an increase of electrical responses, and in the general condition of the muscles.

#### *Discussion and summary*

A brief review of the therapeutic properties of cobra venom has been given. Over a hundred patients have been treated in the out-patients' department of the Calcutta School of Tropical Medicine and in the Carmichael Hospital for Tropical Diseases during the last two years and details of some of these have been recorded. These have been grouped as follows: In group I are included the patients who suffered from indefinite and vague symptoms such as pain and uneasy sensations; in group II the patients suffering from the nerve type of leprosy; in group III the patients suffering from new growths; in group IV the patients who were sensitive to cobra venom injections; and in group V are included patients with old lesions of the central nervous system, such as paraplegia.

In all cases injections of cobra venom were given intramuscularly starting with small doses such as 0.5 to 1 m.u. twice a week. In old and infirm patients the first dose was as small as a quarter or half m.u.; the dose was increased gradually to 10 m.u. and in some cases as much as 20 m.u. was given. The relief of pain as a rule was appreciated after the third or fourth dose. In addition to the relief of symptoms, the patient felt a general improvement in health, increase in appetite, and in some cases increase of sexual desire. Some patients reported a feeling of dullness and sleepiness after each injection but this effect was not prolonged and in no case was addiction to the venom observed, even after continued treatment for two to three months. In some cases the injections were interrupted and saline injections were substituted. There was no relief of pain as long as saline injections were continued showing that the effect of venom was not merely psychological or suggestive in nature. In one of the two patients who showed tabes-like symptoms, the improvement in the pains in the spine and legs

and sensations in the soles of feet was very marked. In the other case the girdle pain sensation was very much exaggerated after each injection. In the patients with neuritis and neuralgias, there was remarkable improvement in some of the cases, e.g., in case 6 with severe brachial neuralgia, the pains were completely relieved after eight injections. In case 7 of sciatica the improvement was only temporary and was not marked. Patients with lumbago and myalgia often improved considerably. In the cases of nerve leprosy a marked relief was obtained in pain and paræsthesia. In some cases there was also a slight recovery of the normal sensation in the anæsthetic patches. Cases 19, 20 and 21 were sensitive to the venom and showed an increase of pain and exaggeration of the original symptoms after each injection. In cases of new growth of the tongue, pharynx and larynx some patients obtained marked relief, so far as pain was concerned, but the growth itself showed no retrogressive changes. In the case of spastic paraplegia due to lathyrism there was no improvement whatever even after 17 injections of cobra venom. The other case of paralysis (case 23) showed improvement in the electrical responses and general consideration of the muscles of the thigh and calf of the affected limb, but this may be attributed to massage and electric treatment.

The analgesic action of the cobra venom would appear to be on the higher psychical areas of the brain though snake venoms have also been shown to have a selective action on some of the nerve terminals. Kellaway and his co-workers have shown that the venoms of Indian colubrids, sea snakes and Australian snakes act mainly on the neuro-muscular apparatus in a manner very much the same way as curara, though the action is not so powerful as this alkaloid. It has also been shown that these venoms act synergistically to curara. Macht and his colleagues by their experimental work have shown that cobra venom has a strong analgesic effect on the sensory nerve endings and this action is very like that of morphine and other opium narcotics. In the doses employed it exerts no marked local anæsthetic effects, but the results of studies regarding its effect on the pain threshold of animals and man and other pharmacodynamic and physiological data indicate that the action of cobra venom on the pain areas of the cerebrum is not unlike that of the opium alkaloids. There is a great difference, however, in the manner in which the morphine and the venom produce analgesic effects. Morphine rapidly induces narcosis which lasts for a comparatively short time; cobra venom requires a longer period to develop its effect, but the analgesia when it is produced is of a very much longer duration. Our own experience is in accord with that of Macht.

In the course of our trials no untoward effects were produced by cobra venom injections. The

venoms of the Indian cobras (*Naia naia* and *Naia tripudians*) and of the Egyptian cobra (*Naia haji*) are all equally effective in this respect.

We have already stated that the analgesic properties of cobra venom reside in the neurotoxin principle. The other active principles such as hæmolysins, hæmorrhagins, and cytolytins are also present in the venom and produce their effects when injected. Recent work has shown that there is a possibility of isolating and separating these active principles on account of differences in their biochemical reactions. Chopra and Roy (1936) have shown that the hæmolytic principle can be separated by passing the venom solution through a Seitz filter. The cytolytin and other principles can also be separated out by heat as they coagulate at different temperatures. The separation of these active principles and a study of their pharmacological action will be interesting and may give us therapeutic remedies of importance.

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## YATREN IN INFECTION WITH INDIAN STRAINS OF *E. HISTOLYTICA* (CHRONIC INTESTINAL AMOEBIASIS)

By R. N. CHOPRA, C.I.E., M.A., M.D. (Cantab.),  
M.R.C.P. (Lond.)

BREVET-COLONEL, I.M.S.

Honorary Physician to H. M. the King

B. SEN, B.Sc., M.B.

and

J. C. GUPTA, M.B.

(From the Department of Pharmacology, School of Tropical Medicine, Calcutta)

YATREN 105 is prepared by Bayer-Meister Lucius and is 7-iodo-8 hydroxy-quinoline-5 sulphonic acid. It is a finely crystalline powder,

(Continued from previous column)

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pale yellow in colour; it easily absorbs moisture and therefore must be kept dry. It has 36.2 per cent of sodium carbonate added to increase its solubility. It has no odour; it has a solubility of 4 to 5 per cent in water. When dissolved it is said to become iodine-oxy-quinoline sulphate of sodium with liberation of  $\text{CO}_2$ .

Yatren is also known by the names of loretin and quinoxyl. In Japan a brand of locally-prepared iodine-oxy-quinoline sulphate of sodium has been used with success. Chardyl is a Belgian preparation comparable to yatren.

Yatren has been considered by some authorities to be almost as good a specific for amoebic dysentery as quinine is for malaria. It is also said to be effective in bacillary dysentery. The claims regarding its efficacy in intestinal amoebiasis while strongly pressed by some workers have not been substantiated by others. Mühlens and Menk (Knowles and others, 1928) were the first to use yatren in eight resistant cases of chronic intestinal amoebiasis with remarkable clinical improvement. They gave it by the mouth in the form of keratine-coated pills in doses of 1.0 gm. three times a day, supplemented with rectal injections of 2.5 per cent solution when ulceration was present. A further course of three to seven days was given after a week's interval and later one more if necessary. A number of other workers have tried the drug and have found it to be an effective remedy in both acute and chronic forms of intestinal amoebiasis. According to Akashi (Chopra, 1936) yatren at first killed the *E. histolytica* present in the lumen of the intestines and then gradually attacked those in the superficial layers of the intestinal wall. Emetine, on other hand, did not act on the amoeba in the lumen of the gut, but killed them in the intestinal tissue. A combination of the two drugs was therefore recommended, emetine being first given in the acute stages followed by yatren in the later stages. Dalmeyer (Knowles and others, 1928) found yatren unfailingly successful, both in acute and chronic amoebic dysentery, and a number of other workers in Europe have come to a similar conclusion.

On the other hand, the other group of investigators have not found the drug to be so efficacious. Megaw and Knowles tried it in the Carmichael Hospital for Tropical Diseases on Indian strains of *E. histolytica* with variable results. The dosage recommended, i.e., 1.0 gm. three times a day, produced diarrhoea which was troublesome to the patient although there was no tenesmus. Knowles and others (1928) were of opinion that unless diarrhoea was produced the results of treatment were poor. In fact according to him the drug acted by producing irritation of the mucous membrane of the colon. In a series of 23 cases he treated, the ratio of probable cures to failures worked out to 1:1.3 when yatren was given by the mouth and in six

intractable cases which had a combined treatment with yatren by the mouth and per rectum simultaneously, the ratio was 1:1.5.

The opinion regarding this drug has been so favourable of late years that the senior author thought it worth while to try it again in a series of 50 cases in the Carmichael Hospital for Tropical Diseases to see its effects in infections with Indian strains of *E. histolytica* and in this paper we give the result of our trials. Carbarsone undoubtedly has given uniformly good results in our hands, but there are cases which are resistant to this drug. Besides this, carbarsone is contra-indicated when (1) albuminuria is present, (2) when the liver is damaged, and (3) in some forms of dermatitis. Yatren, if as effective, would be useful in these cases.

The patients in this series were admitted into the Carmichael Hospital for Tropical Diseases under the senior author. Most of them had *E. histolytica* in the stools and suffered from general, rather than intestinal, symptoms. A few were admitted for diseases other than amoebiasis, but examination of their stools showed a fair number of vegetative or cystic forms of *E. histolytica*. Yatren was administered by the mouth in the form of pillets, 4 pillets (1.0 gm.) being given twice daily for 10 days but where *E. histolytica* were still found in the stools the treatment was prolonged for 15 days. The doses recommended by the German workers, i.e., 1.0 gm. (4 pillets) three times a day, could not be given in Indian patients because these produced severe diarrhoea. Where definite ulcers were revealed by sigmoidoscopic examination, a 2 per cent solution of the drug was also used as a bowel wash. The total quantity administered by the mouth amounted to 20 to 30 gm. in the course.

The patients were kept on ordinary diet and for the first one or two days the bowels had to be kept open with a dose of a saline purgative in the morning but from the third day, in most of the cases, a painless diarrhoea ensued. If there was any evidence of a concomitant bacterial infection, a course of auto-vaccine was also administered.

The criterion of cure applied in this series of cases was six or more negative examinations of the stools on different days after cessation of all treatment. It has already been pointed out that this criterion does not indicate that a real cure has been effected, but from experience over many years in this country we have found that six negative examinations indicate in the majority of cases a favourable prognosis, if not a definite cure. The difficulty of keeping the patients in the hospital when the acute symptoms are once relieved is very great and it was for this reason that this standard of cure had to be accepted. Whenever possible patients were kept under observation longer, and more

TABLE I

No.	Sex and age	Duration in months	Laboratory findings before treatment	Treatment	Laboratory findings after treatment	Result	REMARKS
1	F., 32	..	<i>E. h.</i> (cyst) scanty, <i>Trichomonas hominis</i> . W. R. slightly positive.	Yatren 2 pillets, four times a day for 10 days.	Negative 6 exams.	Cured	A case of hypothyroidism. No abdominal symptoms.
2	M., 26	4 × 12	<i>E. h.</i> (cyst) scanty ..	Yatren 4 pillets, b.d., for 10 days.	Do.	Do.	
3	M., 32	..	<i>E. h.</i> (veg. and cyst)	Do.	Do.	Do.	A case of psoriasis. No abdominal symptoms.
4	M., 10	6	<i>E. h.</i> (veg.) ..	Yatren 2 pillets, b.d., for 10 days.	Do.	Do.	
5	M., 45	12	Do. ..	Yatren 4 pillets, b.d., for 10 days.	Do.	Do.	
6	F., 2	1½	<i>E. h.</i> (veg.) very scanty. <i>Bact. ærogenes</i> .	Yatren ½ a pillet, b.d., for 10 days.	Do.	Do.	
7	M., 22	..	<i>E. h.</i> (cyst) scanty, hookworm ova.	Yatren 4 pillets, b.d., for 10 days.	Negative 1 exam.	Indeterminate.	
8	F., 4	..	<i>E. h.</i> (veg. and cyst), <i>Bact. asiaticus</i> , <i>Bact. mobilis</i> , <i>Bact. pseudo-asiaticus</i> , <i>Bact. metalcaligenes</i> .	Yatren 1 pillet, b.d., for 15 days.	Negative 6 exams.	Cured	
9	M., 10	8	<i>E. h.</i> (veg.) scanty, <i>Trichomonas hominis</i> , <i>Bact. para-asiaticus</i> , <i>Bact. ærogenes</i> , hookworm ova.	Yatren 3 pillets, b.d., for 10 days.	Do.	Do.	A case of kala-azar with irregular bowels.
10	M., 30	12	<i>E. h.</i> (veg. and cyst), microfilaria in blood.	Yatren 4 pillets, b.d., for 10 days.	Do.	Do.	
11	M., 40	..	<i>E. h.</i> (cyst) scanty, <i>E. nana</i> (cyst), hookworm ova.	Do.	No stool exam. done.	Indeterminate.	
12	M., 20	1 × 12	<i>E. h.</i> (veg. and cyst) scanty, <i>Bact. ærogenes</i> , ascaris ova.	Do.	Negative 6 exams.	Cured	
13	M., 34	2	<i>E. h.</i> (veg. and cyst) very scanty, <i>Blastocystis hominis</i> scanty, M. T. rings in blood.	1. Yatren 4 pillets, b.d., for 5 days. 2. Yatren 3 pillets, b.d., for 5 days.	Do.	Do.	
14	M., 29	..	<i>E. h.</i> (veg.) scanty, <i>Bact. ærogenes</i> , ascaris ova. Mid-stream urine shows <i>Staphylococcus aureus</i> on culture. Microfilaria in blood.	Yatren 4 pillets, b.d., for 10 days.	Do.	Do.	A case of filariasis. No definite abdominal symptoms.
15	M., 34	1½ × 12	<i>E. h.</i> (veg.) scanty, C.-L. crystals scanty, <i>Bact. douglasi</i> .	Do.	<i>E. h.</i> (cyst) scanty. C.-L. crystals scanty.	Failed	
16	M., 25	4	<i>E. h.</i> (veg.) +, cellular exudate +, microfilaria in blood.	Yatren bowel wash for 10 days.	No stool exam. done.	Indeterminate.	Marked clinical improvement.
17	M., 30	..	Protozoa negative. C.-L. crystals. <i>Bact. pseudocarinatus</i> .	Do.	Do.	Do.	Ba. mcal shows colitis.
18	M., 25	..	<i>E. h.</i> (veg. and cyst) scanty, <i>I. butschlii</i> (veg. and cyst), <i>Chilomastix</i> , <i>Trichomonas hominis</i> , hookworm and trichuris ova. Microfilaria in blood. Marked anæmia, hypacidity.	Yatren 4 pillets, b.d., for 10 days.	Negative 6 exams. <i>Trichomonas hominis</i> .	Cured	
19	M., 54	..	<i>E. h.</i> (cyst) +, <i>E. coli</i> (cyst) +, <i>E. nana</i> (cyst) +.	Yatren 4 pillets, b.d., for 10 days.	Negative 3 exams.	Indeterminate.	

TABLE I—contd.

No.	Sex and age	Duration in months	Laboratory findings before treatment	Treatment	Laboratory findings after treatment	Result	REMARKS
20	M., 42	18 × 12	<i>E. h.</i> (veg.) scanty. <i>Lambliia intestinalis</i> (cyst).	Yatren 4 pillets, b.d., for 15 days.	Negative 6 exams.	Cured	
21	M., 32	..	<i>E. h.</i> (veg.) +, <i>Bact. asiaticus mobilis</i> . Microfilaria in blood.	Do.	<i>E. h.</i> (veg.) very scanty.	Failed	
22	M., 45	2½ × 12	<i>E. h.</i> (veg.) scanty, <i>Trichomonas hominis</i> scanty, <i>E. nana</i> (veg. and cyst), trichuris ova, <i>Bact. pseudo-carolinus</i> .	1. Yatren 4 pillets, b.d., for 10 days. 2. Six injections of autovaccine ( <i>Bact. pseudo-carolinus</i> ).	<i>E. h.</i> (veg.).	Do.	
23	M., 40	2 × 12	Degenerated <i>E. h.</i> (veg.), <i>Bact. pseudo-carolinus</i> .	Yatren 4 pillets, b.d., for 15 days.	Negative 5 exams.	Indeterminate.	
24	M., 34	..	<i>E. h.</i> (veg.) scanty, <i>Bact. pseudo-carolinus</i> .	1. Yatren 4 pillets, b.d., for 10 days. 2. Six injections of autovaccine ( <i>Bact. pseudo-carolinus</i> ).	<i>E. h.</i> (veg.)	Failed	
25	M., 17	7/30	C.-L. crystals ..	Yatren 4 pillets, b.d., for 11 days.	No stool exam. done.	Indeterminate.	Relief of the acute symptoms.
26	M., 27	2 × 12	<i>E. h.</i> (cyst) very scanty, <i>Lambliia intestinalis</i> (cyst), <i>E. nana</i> (cyst) +, <i>Bact. asiaticus</i> .	Yatren bowel wash	Negative 6 exams.	Do.	Amibiarsen given orally. Ulcers partially healed up. Improvement in the general condition.
27	M., 14	1	<i>E. h.</i> (veg. and cyst)	Yatren 4 pillets, b.d., for 15 days.	Negative 5 exams.	Do.	
28	M., 14	4	<i>E. h.</i> (veg.) +, C.-L. crystals, <i>Bact. metalcaligenes</i> .	Yatren 4 pillets, b.d., for 15 days.	Negative 9 exams.	Cured	
29	M., 3	3/30	<i>E. h.</i> (veg. and cyst) +, hookworm and ascaris ova.	Yatren 4 pillets, b.d., for 10 days.	Degenerated cyst of <i>E. h.</i>	Indeterminate.	
30	F., 55	1 × 12	<i>E. h.</i> (veg. and cyst) +, hookworm and ascaris ova. <i>Bact. alkaligenes</i> , <i>Ps. pyocyaneus</i> .	Yatren 4 pillets, b.d., for 15 days.	Negative 5 exams.	Do.	
31	M., 29	1 × 12	<i>E. h.</i> (cyst) +, hookworm ova. Microfilaria in blood.	Yatren 4 pillets, b.d., for 14 days.	Negative 6 exams.	Cured	
32	M., 5	1 × 12	<i>E. h.</i> (veg.) +, cellular exudate +, enterococci +, <i>Bact. aerogenes</i> .	Yatren 1 pillet, t.d.s., for 10 days.	Negative 6 exams. Giardia cysts.	Do.	
33	M., 50	1	<i>E. h.</i> (veg.) scanty, <i>Bact. aerogenes</i> .	Yatren 4 pillets, b.d., for 15 days.	1. Neg. to <i>E. h.</i> 6 exams. 2. <i>Bact. asiaticus</i> .	Do.	Emetine outside.
34	F., 40	1 × 12	<i>E. h.</i> (veg. and cyst) scanty, <i>E. nana</i> (cyst) scanty, <i>enteromonas</i> , <i>Bact. alkaligenes</i> .	Yatren 4 pillets, b.d., for 15 days.	Negative 6 exams.	Do.	
35	M., 29	1 × 12	<i>E. h.</i> (veg.) +, <i>E. nana</i> cysts scanty.	Yatren 4 pillets, b.d., for 10 days.	Do.	Do.	
36	M., 39	6	<i>E. h.</i> (cyst) scanty, <i>E. coli</i> (cyst) scanty.	Yatren 4 pillets, b.d., for 15 days.	Do.	Do.	
37	M., 23	2 × 12	<i>E. h.</i> (cyst) scanty, <i>E. nana</i> cysts, <i>I. butschlii</i> (veg. and cyst).	Do.	<i>E. h.</i> cyst very scanty.	Failed	
38	F., 44	2½ × 12	<i>E. h.</i> (veg.) scanty, <i>Bact. asiaticus</i> .	1. Yatren 4 pillets, b.d., for 10 days. 2. Autovaccine ( <i>Bact. asiaticus</i> ).	<i>E. h.</i> (veg.) scanty.	Do.	



TABLE I—concl'd.

No.	Sex and age	Duration in months	Laboratory findings before treatment	Treatment	Laboratory findings after treatment	Result	REMARKS
39	M., 25	2 × 12	<i>E. h.</i> (veg.) scanty, <i>Ps. pyocyanea</i> , streptococci, hookworm and trichuris ova, <i>M. T.</i> rings in blood.	1. Yatren bowel wash. 2. Autovaccine (streptococcus).	Negative 6 exams.	Given carbarson orally.	
40	M., 28	6 × 12	No protozoa ..	Yatren 1 pillet, t.d.s., for 7 days.	No stool exam. done.	Indeterminate.	No improvement.
41	M., 35	3/30	<i>E. h.</i> (cyst) + ..	1. Yatren 4 pillets, b.d., for a day. 2. Yatren 2 pillets, b.d., for 1 day. 3. Yatren 4 pillets, b.d., for 3 days.	Do.	Do.	Left hospital before completion of treatment.
42	M., 41	..	<i>E. h.</i> (cyst) +. Urine: Staphylococcus.	Yatren 4 pillets, b.d., for 10 days.	<i>E. h.</i> (veg. and cyst).	Failed	Admitted for lymphangitis.
43	F., 24	10	<i>E. h.</i> (cyst) +, C.-L. crystals, <i>Bact. pseudocarinatus</i> .	Yatren 4 pillets, b.d., for 10 days.	Negative 6 exams.	Cured	Emetine outside.
44	M., 30	1½	<i>E. h.</i> (cyst) scanty. <i>Lamblia intestinalis</i> (cyst) scanty.	Do.	Negative 7 exams.	Do.	
45	M., 35	1½ × 12	<i>E. h.</i> (veg. and cyst) +, trichuris ova, microfilaria in blood.	Do.	Negative 6 exams.	Do.	
46	M., 19	..	<i>E. h.</i> (cyst) scanty, hookworm ova.	1. Yatren 2 pillets, t.d.s., for 1 day. 2. Yatren 2 pillets, b.d., for 7 days. 3. Yatren 4 pillets, b.d., for 6 days.	Do.	Do.	Admitted for splenomegaly.
47	M., 26	7	<i>E. h.</i> (cyst) +, <i>Bact. aerogenes</i> , microfilaria in blood.	Yatren 4 pillets, b.d., for 10 days.	Negative 6 exams.	Failed	
48	F., 34	5/30	<i>E. h.</i> (veg.) + ..	Do.	Do.	Do.	
49	M., 20	..	<i>E. h.</i> (cyst) +, hookworm ova, trichostrongyloids.	Do.	Do.	Do.	
50	M., 35	..	No protozoa ..	Yatren 4 pillets, b.d., for 3 days.	No stool exam. done.	Indeterminate.	

examinations were made. The results of the investigation are analysed and given below.

Out of 50 patients 28 (56 per cent) were cured, and in 16 (32 per cent) the results were indeterminate, as the patients left the hospital before the total number of six examinations required could be completed. Some of these indeterminate cases showed considerable clinical improvement in their general condition. Entamoebæ were found in the stools of six patients after treatment and in these the treatment had definitely failed.

A perusal of the table shows that the majority of the cases showed the parasite in the cystic stage. The separate cure rates in vegetative and cystic infections are given below and it will be seen that the drug appears to be somewhat more effective when cysts were found in the stools than when vegetative forms were found.

The proportion of probable cures to failures in this series is 4.6:1 as compared with 5.75:1 and 3.16:1 obtained by Chopra, Sen and Sen

(1933) and by Acton and Chopra (1929) with carbarson and kurchi bismuth iodide, respectively, in a similar series of chronic cases. It may be noted here that case 15 showed the protozoa in the cystic stage after the treatment was over, although the parasites were present in

TABLE II.

<i>E. histolytica</i>	Cured, per cent	Indeterminate (with favourable prognosis), per cent	Failed, per cent
Cystic form ..	62.9	29.6	7.5
Vegetative form ..	57.9	15.9	26.2

the vegetative form before treatment was started. The stool of case 17 was negative to *E. histolytica*, but radiographic examination revealed a condition of chronic ulcerative colitis.

In this case yatren bowel wash produced considerable clinical improvement. Examination of the stool of case 26 showed *E. histolytica* in the cystic stage and ulcers were found on rectal examination. In this patient yatren was not administered by mouth, but was used as a rectal wash. No change, either in the symptoms or in the ulcers, was observed.

No untoward symptoms were met with in this series during treatment with yatren. The diarrhoea which ensued after the second day of treatment continued till the course of treatment was over and was not troublesome in the majority of cases. This looseness of the bowels appears to be beneficial inasmuch as it keeps the ulcers free from irritation by the intestinal contents and helps in eliminating the toxins. Yatren is absorbed from the intestines and is excreted by the kidneys in the urine which gives a positive oxy-quinoline test, i.e., green colour with ferric chloride. It is absolutely non-irritant to the kidney and therefore can be given where albuminuria is present. It is also well borne when the liver is diseased and therefore in both these conditions, as well as in those in which there is a tendency to dermatitis, it can replace carbarsone with advantage.

### Conclusions

From the small series of patients we have treated, we are justified in drawing the following conclusions :—

(1) Yatren possesses well-marked amœbicidal properties in doses of 1.0 gm. twice daily for 10 to 15 days in infections with Indian strains of *E. histolytica*. It is worthy of trial in cases of acute and chronic intestinal amœbiasis in this country.

(2) No untoward symptoms were noticed except mild painless diarrhoea which started on the second or third day of treatment and went on till the treatment was completed.

(3) Yatren is specially indicated in those patients who suffer from pathologic conditions of the liver and the kidneys and in certain forms of dermatitis where carbarsone is contra-indicated.

We are grateful to the Havero Trading Company for supplying us the drug for this trial free of cost.

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## \*CYANIDE POISONING AND ITS TREATMENT WITH ANTIDOTES

By B. MUKERJI, M.B. (Cal.), D.Sc. (Mich.)

(From the Biochemical Standardization Laboratory, All-India Institute of Hygiene and the Department of Pharmacology, School of Tropical Medicine, Calcutta†)

### Introductory

HYDROCYANIC ACID is one of the earliest of poisons known. It is said to have been used by the ancients in the form of an infusion of peach leaves or kernels or of the seeds of other fruits in which the acid might be liberated. Scheele was the first to isolate the acid from the familiar prussian blue. He not only established its correct chemical identity but also tested some of its pharmacological properties on himself. Bohm and Schrader, following Scheele's method, demonstrated its presence in bitter almonds and in cherry and peach leaves. Throughout the nineteenth century, and more particularly during the last quarter, numerous contributions were made with regard to the effects of the poison on all forms of living matter—from the bacteria and unicellular organisms to the more highly-developed species of the mammalian kingdom. Within the last 20 years, the study of the cyanide problem has gained an added impetus due mainly to the brilliant researches on tissue respiration and cellular oxidation-reduction phenomena by Warburg (1923) and Keilin (1927). The discovery of some of the new antidotes to combat cyanide intoxication has further opened up an extremely interesting field of study into some of the peculiar biochemical defence mechanisms of the body. The introduction of some of these antidotes in clinical practice promises to offer a successful means of combating a desperate condition for which no satisfactory means were available only four years ago.

### Incidence of cyanide poisoning

In recent years, accidental, occupational, and industrial cyanide poisonings have occurred with increasing frequency and hence the subject has attracted the attention of toxicologists and clinicians. Accidental poisonings result chiefly from fumigation and in chemical and photographic laboratories. There are also occasional cases of poisoning from the ingestion of bitter almonds. The escaping vapour in certain

\*The work reported in this paper was begun under the auspices of the Rockefeller Foundation in the Pharmacological Laboratories of the University of Michigan, U. S. A., and was submitted in partial fulfilment of the requirements for the Degree of Doctor of Science. A preliminary report was made at the meeting of the British Pharmacological Society at Cambridge (1936) and also at the monthly meeting of the Royal Asiatic Society at Calcutta (1937).

†With the permission of the Director, Colonel R. N. Chopra, C.I.E., K.H.F., I.M.S.

chemical processes, notably gilding, electroplating and celluloid industries, is quite often dangerous to the workers. Homicidal attempts are rather rare, though deliberate poisonings by mixing cyanides in food, drink or medicines are not unknown. Suicidal deaths have been most frequent; mortality statistics of both the United States and Canada show that cyanide poisoning is fairly frequent. Out of 243 deaths due to cyanide poisoning in one of the American cities, 241 were suicidal. Exact statistics are not available in India but it appears probable that suicidal deaths due to ingestion of cyanides are becoming more frequent.

### Occurrence and general prevalence of cyanides

Hydrocyanic acid occurs in the free condition in certain plants, formed as a result of decomposition of the glucoside, amygdalin which is found in the leaves of the cherry and laurel, in bitter almonds, peach kernels and in other substances. 'There are in the vegetable kingdom at least 360 varieties in 148 species and 41 families yielding hydrocyanic acid' (Chen *et al.*, 1934).

The poisonous property is in some way associated with the cyanogen (CN) radicle. Substances from which this ion is liberated, *e.g.*, HCN, KCN or NaCN, halogen derivatives of cyanides, aliphatic nitrils, etc., are poisonous whereas those like pot. ferrocyanide, metallic ferrocyanides and aromatic nitrils are practically non-poisonous. From the pharmacological and toxicological standpoints, hydrocyanic acid and the two salts of sodium and potassium are important. They are comparatively less toxic than the acid itself. The relative toxicities on the basis of weight of the three may be represented as follows:— HCN—100; KCN—41.5; NaCN—55.5 (Hug, 1934).

Cyanides are used in medicine, *e.g.*, syrup of Virginian prunes (15 per cent infusion), acid HCN dil. (2 per cent). HCN gas is extensively used by the public-health authorities for the deratization of ships. Fumigation of buildings, underground vaults and cellars is also common. Sanitary fumigation is being advocated, to exterminate bed-bugs from furniture and mosquitoes from aeroplanes. Sodium cyanide has been recommended in fly eradication in some tropical countries. Cyanides are widely employed in the manufacture of dyes, in photography and in industries like electroplating, gilding and mirror-polishing.

### Antidotes used in cyanide poisoning

The characteristic symptoms of cyanide intoxication are so well known to the medical profession that it is not necessary here to describe them in detail. It is generally considered to be a most dangerous poison. In extreme cases, death may follow in a few seconds from simultaneous arrest of the heart and respiration.

The search for an effective antidote to counteract cyanide poisoning has attracted a large number of investigators. Such interest naturally arose from the drastic and characteristic effects which the poison manifested in the animal body. In 1895, Lang first reported the value of sodium thiosulphate ( $\text{Na}_2\text{S}_2\text{O}_3$ ). During the last 40 years, numerous remedies, differing widely in their physical properties and chemical characteristics, have been advocated for the treatment of cyanide poisoning.

Table I gives a classified list of the antidotes which have been used from time to time. The modern concepts with regard to the fundamental mechanisms involved in the detoxication process appear to justify such a classification.

TABLE I

A

#### Substances capable of liberating sulphur

- (i) Sodium thiosulphate ( $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$ ).
- (ii) Sodium tetrathionate ( $\text{Na}_2\text{S}_4\text{O}_6 \cdot 2\text{H}_2\text{O}$ ).
- (iii) Colloidal sulphur.
- (iv) Cystine and thiol compounds, *e.g.*, cysteine, glutathione.
- (v) Other sulphur derivatives, *e.g.*,  $\text{H}_2\text{S}$  and  $\text{Na}_2\text{S}$ , isobutyl sulphhydrate, potassium xanthogenate, thialdin, carbothialdin, thiolactic acid, L- and D-thiolactic acid, sulphur derivatives of pyrotartaric acid, thioglycolic acid, etc.

B

#### Derivatives of sugar

- (i) Glucose.
- (ii) Aldehydes and acetones, *e.g.*, glucosone, dihydroxyacetone, glyceric aldehyde (triose), etc.

C

#### Methæmoglobin-forming substances

- (i) Nitric group, *e.g.*, inorganic nitrites ( $\text{NaNO}_2$ ). Nitrous esters, *e.g.*, amyl nitrite. Substances liberating nitrite ion in the body (nitroglycerine).
- (ii) Methæmoglobin and other methæmoglobinizers, *e.g.*, diphenols, triphenols, sodium hydrosulphide, etc.
- (iii) Methylene blue.

D

#### Combination of antidotes

- (i) Dihydroxyacetone + colloid sulphur.
- (ii) Dihydroxyacetone + sodium thiosulphate.
- (iii) Sodium nitrite + sodium thiosulphate.
- (iv) Methylene blue + sodium tetrathionate.
- (v) Sodium nitrite + sodium thiosulphate, etc., etc.

E

#### Miscellaneous remedies

- (i) Iron salts to form ferro- or ferriyanides, *e.g.*, ferric phosphate, ferric chloride, double tartrate of sodium and iron.
- (ii) Alcohol to form cyanohydrin.
- (iii) Depressants, *e.g.*, morphine, scopolamine, barbital, etc., etc.
- (iv) Oxidants, *e.g.*, potassium permanganate and hydrogen peroxide.
- (v) Dyes, *e.g.*, toluidine blue, methylene blue, dinitrophenol, etc.
- (vi) Cobalt salts, *e.g.*, cobalt nitrate, cobalt chloride, cobalt sulphate, etc.

### Present status of knowledge about cyanide antidotes

A short review is necessary to indicate the development of the subject.

#### A. Substances capable of liberating sulphur.

Sodium thiosulphate was introduced by Lang (1894) on the basis of biochemical experiments in the laboratory where he found HCN to be converted into a non-toxic substance as a result of interaction with  $\text{Na}_2\text{S}_2\text{O}_3$ . His optimism with regard to the success of the method, however, has not been borne out by later investigations. Heymans and Masoin (1900) found that  $\text{Na}_2\text{S}_2\text{O}_3$  was effective against two lethal doses of HCN (0.40 to 0.45 mg. per kg.) in rabbits, provided the thiosulphate is injected prior to the administration of the poison. The results were far from satisfactory when the antidote was given either during or immediately afterwards. They remarked that  $\text{Na}_2\text{S}_2\text{O}_3$  was a 'preventive' and not a 'curative' remedy. Later, work with HCN and other CN derivatives (cyanides, nitrils, etc.) extended and generally confirmed the sound observations of Lang and of Heymans and Masoin as to the antidotal value of the drug, particularly when injected immediately before the poison [Meurice (1900); Hunt (1904); Teichmann and Nagel (1919); Milanese (1926); Forst (1928)].

Within the last five years, the antidotal efficiency of  $\text{Na}_2\text{S}_2\text{O}_3$  has been reinvestigated with a view to eliminating some of the variable factors reported in earlier experiments. Hug (1932) demonstrated in rabbits that  $\text{Na}_2\text{S}_2\text{O}_3$  has both 'preventive' and 'curative' effects depending on the velocity of absorption of the toxin and the moment of injection of the antidote. It was practically useless when injected one hour before or 10 minutes after the poison. Turner and Hulpieu (1933) found that in the majority of their experiments on rabbits,  $\text{Na}_2\text{S}_2\text{O}_3$  failed to show a conclusive antidotal effect when a surely-fatal dose of cyanide was given. Hanzlik and Richardson (1934) obtained positive results against 1 minimum lethal doses (M.L.D.) of the poison in pigeons. Chen *et al.* (1934) reported success against 3 M.L.D. of NaCN in dogs.

Negative results were reported by Flury and Heubner (1919) in cats poisoned with HCN vapour. De Somer could not demonstrate any resuscitative effect of  $\text{Na}_2\text{S}_2\text{O}_3$  on malonitrile-poisoned perfused hearts of frogs and dogs. In cold-blooded animals,  $\text{Na}_2\text{S}_2\text{O}_3$  proved either of doubtful or of negative value [Achard and Binet (1934); Combes (1927); Calatroni (1928)].

In spite of the wide variations in the experimental conditions and the species of experimental animals used by different investigators, the antidotal value of  $\text{Na}_2\text{S}_2\text{O}_3$  seems to be fairly well established in the warm-blooded animals. The other sulphur derivatives have not been used as frequently as sodium thiosulphate. Encouraging reports are available about sodium tetrathionate but there is no satisfactory evidence that it is in any way superior to  $\text{Na}_2\text{S}_2\text{O}_3$ . The antidotal value of the other sulphur derivatives is only slight as compared with  $\text{Na}_2\text{S}_2\text{O}_3$  or  $\text{Na}_2\text{S}_2\text{O}_4$ .

#### B. Derivatives of sugar

Next to sulphur derivatives, the reducing sugars have been investigated most frequently. Hunt (Heffter, 1923) found glucose effective against 4 M.L.D. of acetonitrile in rats. Later observers found its action rather indifferent and very evanescent. Forst (1928) found glucose and insulin effective against 4 M.L.D. of the poison, if injected beforehand. The products of glucose breakdown (e.g., glyceric aldehyde, dihydroxyacetone, methylglyoxal, etc.) therefore might have some part to play in counteracting the poison. This suggested the idea of trying their value directly. Dihydroxyacetone was found of value against 9 M.L.D. of cyanide if injected prior to the poison. Schwab (1929) tried it in various species of animals with moderate success. Marshall and Rosenfeld (1934) also reported positive antidotal results with dihydroxyacetone. Glyceric aldehyde or triose gave

the best results in the hands of Forst (1932). It was a good prophylactic and also resuscitative after symptoms of poisoning were developed. It is not sufficiently non-toxic however to be used in large doses.

There is general agreement that reducing sugars have a detoxifying action *in vitro* and on isolated tissues poisoned with cyanide [Bougault and Perrier (1920); Saint Rat (1926); Forst (1932); Moretti and Muscolino (1931)]. From the practical view-point, however, the sugars are not found to be very reliable antidotes. Though the reports about dihydroxyacetone and triose are encouraging, they have an extremely transient action and are also comparatively toxic.

#### C. Methæmoglobin-forming substances

The introduction of this group of substances in the treatment of cyanide poisoning is due mainly to the researches of Hug (1932) who first gave the correct interpretation of the mechanism of action. Wendel (1933) working independently came to the same conclusion.

It is interesting to note that the idea of a combination between cyanide and the blood pigment existed for a long time. As early as 1867, Hoppe-Seyler described the isolation of a HCN-hæmoglobin crystalline compound called 'cyanhæmoglobin'. Robert from spectroscopic and other observations brought forward evidence to show that cyanide combined with methæmoglobin and gave rise to 'cyanmethæmoglobin'. Szigeti indicated more definitely that cyanhæmatin (really cyanmethæmoglobin) cannot occur without first producing methæmoglobin. Sodium nitrite was known to produce methæmoglobin for a long time and it was also recognized that cyanide had a strong affinity for combining with methæmoglobin but the important practical application of this knowledge in the therapy of cyanide poisoning was not realized before. The value of  $\text{NaNO}_2$  as an antidote has since been largely confirmed [Buzzo and Carratala (1933); Chen *et al.* (1933); Hanzlik and Richardson (1934)].

Methylene blue attracted attention as a cyanide detoxicant through the researches of Thunburg (Oppenheimer, 1930) and Warburg (1931) on the oxidation-reduction phenomena of yeast cells. Heymans and Maigre (1922) first used it successfully in malonitrile poisoning of dogs. Sahlin (1926) and Eddy (1931) conclusively demonstrated its life-saving and respiratory resuscitative actions in dogs poisoned with HCN. The antidotal value of the drug has since been confirmed on dogs, rats, mice and pigeons by a number of workers [Brooks (1932); Hug and Marenzi (1933); Hanzlik (1933); Chen *et al.* (1934)].

Methylene blue is included in the group of methæmoglobin formers though opinion is sharply divided concerning the true nature of its action. A great mass of experimental evidence has accumulated to show that it may act by replacing cellular respiratory catalysts or by helping in the tissue oxidation-reduction system. Equally convincing evidence is forthcoming from those who ascribe its action to methæmoglobin formation and subsequent combination with cyanide. Further work is needed to determine the true nature of its action.

#### D. Combination of antidotes

Forst (1928) observed that a potentiation of antidotal action resulted when dihydroxyacetone and colloid sulphur were used together. Similar results were obtained by combining dioxycetone and sodium thiosulphate [Turner and Hulpieu (1933); Heymans and Handovsky (1935)]. Hug (1933) conceived the idea of combining  $\text{NaNO}_2$  with  $\text{Na}_2\text{S}_2\text{O}_3$  and obtained very successful results (effective against 6 M.L.D. of HCN). Buzzo and Carratala (1933) obtained still more encouraging results (against 18 M.L.D.) with the same combination. Chen *et al.* (1934) tried combinations of methylene blue and  $\text{Na}_2\text{S}_2\text{O}_3$ , amyl nitrite and  $\text{Na}_2\text{S}_2\text{O}_3$ ,  $\text{NaNO}_2$  and  $\text{Na}_2\text{S}_2\text{O}_3$ , and  $\text{NaNO}_2$  and  $\text{Na}_2\text{S}_2\text{O}_3$ . The results in general indicated unequivocally that combination therapy always resulted not merely in a simple additive effect but a definite potentiation or synergism.

of published data to warrant a tentative explanation. Lang (1894) postulated, on the basis of *in vitro* experiments, that cyanide is converted into thiocyanate by a process of oxidation in the presence of a sulphur derivative,  $\text{NaCN} + \text{Na}_2\text{S}_2\text{O}_3 + \text{O} = \text{NaSCN} + \text{Na}_2\text{SO}_4$ .

Lang (1933) has recently published data which bring into prominence the possibility of enzymatic conversion instead of simple oxidation.

$\text{HCN} + \text{Na}_2\text{S}_2\text{O}_3 + \text{liver pulp} \rightarrow \text{NaSCN}$   
in a few minutes.

$\text{HCN} + \text{Na}_2\text{S}_2\text{O}_3 + \text{liver pulp (heated)} \rightarrow \text{No NaSCN}$ .

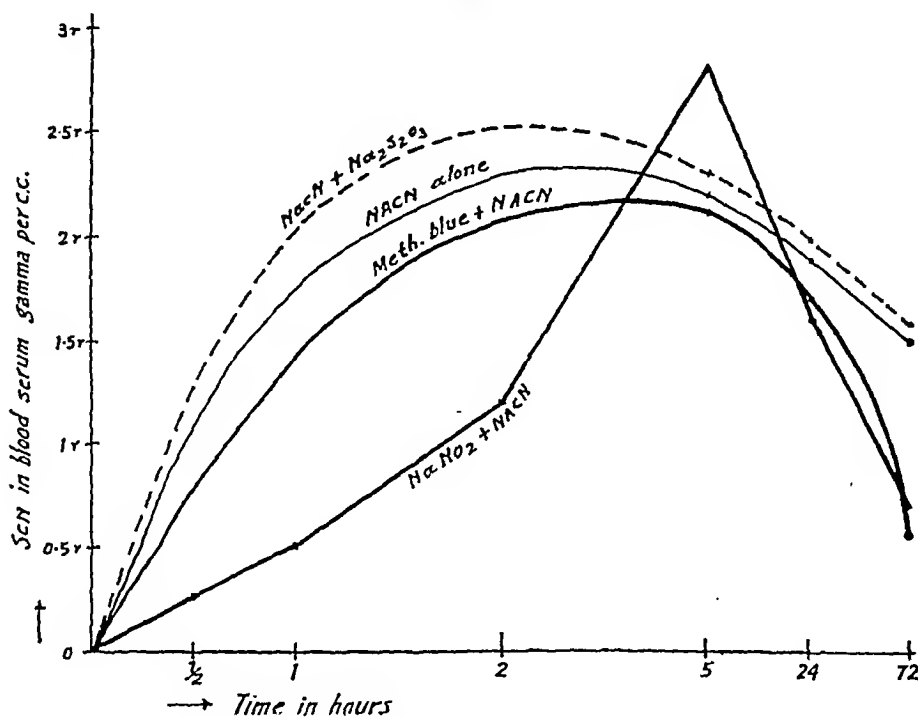
into HSCN through the mediation of the body sulphur.

Sodium nitrite, as has been mentioned already, combines readily with hæmoglobin to form methæmoglobin. Under ordinary circumstances, methæmoglobin is reconverted in the circulating blood into oxyhæmoglobin. If, however, cyanide is present, a comparatively stable and non-toxic compound, cyanmethæmoglobin, is formed.

$\text{NaNO}_2 + \text{Hæmoglobin} \rightarrow \text{Methæmoglobin}$ .

$\text{Methæmoglobin} + \text{NaCN} \rightleftharpoons \text{cyanmethæmoglobin}$ .

GRAPH 1



Average increase in SCN in blood after treatment with antidotes compared to NaCN curve.

There seems little doubt that SCN formation does take place in the body as is evidenced by its normal occurrence in urine and saliva. The almost complete conversion of ingested cyanide into thiocyanate as shown in our experiments is also in accordance with this view. Both oxidation and enzymatic conversion probably take place, the sulphur being supplied either from outside or from the sulphur constituents of the body, e.g., cystine, cysteine, glutathione.

It is a well-known chemical fact that reducing sugars combine with HCN. The reaction *in vitro* may be represented as follows:—

$\text{R.CHO (aldehyde)} + \text{HCN} \rightleftharpoons \text{R.CHOH.CN (cyanohydrin)}$ .

Probably a similar reaction takes place in the body and CN gets fixed as cyanohydrin. Cyanohydrins are however unstable and may liberate HCN later. The ultimate detoxification of this HCN is accomplished by conversion

Cyanmethæmoglobin is broken down again releasing HCN which is ultimately counteracted in the usual way by conversion into SCN.

Methylene blue, according to Hug (1933) and Wendel (1932, 1933, 1935) acts through the same mechanism of methæmoglobin formation. Brooks (1933 and 1935), however, has given evidence to show that it might act directly on the cyanide poisoned tissues as a hydrogen acceptor.

$\text{Methylene blue} + \text{H (from substrate)} \rightarrow \text{leucomethylene blue (hydrogen acceptor)}$ .

$\text{Leucomethylene blue} + \text{molecular O}_2 \rightarrow \text{methylene blue (hydrogen donor)}$ .

Judged from the rate of SCN formation in the blood serum as represented in graph I, it appears that methylene blue action probably belongs to this latter type. Anyway, it does not follow the same course as after  $\text{NaNO}_2$ . At the end of 24 hours, the SCN excretion is seen to be closely proportionate in all the cases.

This further supports the view that the ultimate detoxification is by the formation of SCN. The cyanohydrin formation in the case of the sugar derivatives and the cyanmethæmoglobin formation in case of the methæmoglobinizers only serve the purpose of converting an acute intoxication into a subacute or chronic one, thereby saving the tissues from immediate death. Another interesting point is the increased SCN excretion when  $\text{NaCN} + \text{Na}_2\text{S}_2\text{O}_3$  is injected. It indicates that, provided ready sulphur is available, the speed of conversion from CN to SCN may be accelerated. This is probably one explanation of the potentiation of action seen when  $\text{Na}_2\text{S}_2\text{O}_3$  is injected along with  $\text{NaNO}_2$  or methylene blue.

#### Treatment

From the results and questions that have been discussed, the first choice of antidote in treating cyanide poisoning is  $\text{NaNO}_2 + \text{Na}_2\text{S}_2\text{O}_3$  combination therapy. Of the single antidotes, sodium nitrite and methylene blue are the two which require consideration. Sodium thiosulphate is not a suitable antidote in resuscitative treatment, and, when symptoms are developed, it fails to produce any marked effect. It is of great value when injected prior to the introduction of the poison but this property naturally has no bearing on practical therapeutics.

There has been considerable divergence of opinion with regard to the suitability of the two antidotes—sodium nitrite and methylene blue. In experimental animals, there seems little doubt that  $\text{NaNO}_2$  is the better of the two, but the question has to be discussed from various angles before coming to a final decision. To understand the full significance of the issues involved, it is necessary to have some idea about the nature of cyanide intoxication. One of the earliest observed manifestations of CN poisoning was the bright red colour of the venous blood and this naturally suggested an interference with the oxygen exchange. Claude Bernard thought that the phenomenon was due to a cyanide-hæmoglobin combination, but Hoppe-Seyler pointed out later that cyanide inhibited tissue oxidation without influencing hæmoglobin function. The latter view is now considered to be correct. Methylene blue is known to increase tissue oxidation both *in vitro* and *in vivo* and is further capable of stimulating respiration in cyanide-poisoned tissues. The antidotal value of methylene blue, therefore, appears to be based on sound logic. It may be argued that methylene blue also forms methæmoglobin and thereby would tend to diminish the oxygen capacity of blood. Methæmoglobin formation by methylene blue is negligible, if produced at all. It will not be sufficient in any case to counterbalance the favourable effect produced otherwise. As has been pointed out before, sodium nitrite acts as an antidote by combining with hæmoglobin resulting in the formation of

methæmoglobin. As this process reduces the oxygen capacity, the efficacy of  $\text{NaNO}_2$ —in fact any other methæmoglobinizer—is strictly limited by the amount of the hæmoglobin that can be safely converted into methæmoglobin (conversion of two-thirds hæmoglobin to methæmoglobin is fatal). Further the nitrites possess an intense hypotensive action and this might lead to sustained circulatory collapse. This would naturally defeat the very object for which the antidote will be administered.

It is very difficult, therefore, to come to a conclusion with regard to the choice of the antidote. In the present state of our knowledge, both the remedies could be considered useful, and worthy of further trial. Combination with  $\text{Na}_2\text{S}_2\text{O}_3$  is always advantageous.

The writer's experience is limited entirely to the laboratory. Whether the results obtained in animal experiments can be transferred *in toto* to human cases cannot be decided. Ordinarily cases of cyanide poisoning are reported too late and hence clinical trials of the antidotes have been meagre. Only one case has so far been treated with  $\text{NaNO}_2$ , the dose employed being 0.5 gm. (1 per cent solution) intravenously. There was considerable cyanosis but the patient was ultimately saved (Mota, 1933). Viana, Cagnoli and Cendan (1934) reported two cases where a combination therapy ( $\text{NaNO}_2 + \text{Na}_2\text{S}_2\text{O}_3$ ) was successful. The maximum dosage employed was 1.5 gm.  $\text{NaNO}_2$  and 18 gm.  $\text{Na}_2\text{S}_2\text{O}_3$ . There was marked cyanosis and pallor but recovery was uneventful. Methylene blue was first used clinically in HCN poisoning by Geiger (1932, 1933) with success. The dose employed was 50 c.c. (1 per cent solution) intravenously. Since then other cases have also been reported (Geiger and Gray, 1933, 1934). From these recorded cases, it seems very probable that cyanide poisoning in human beings may be successfully treated provided the cases are brought to notice sufficiently early and the dose of the poison taken is not too large. According to Hanzlik, 'clinical cyanide poisoning is not always as rapidly fatal as may be imagined from textbook statements. There is generally considerable cyanosis in man and symptoms or unconsciousness may be present for two or three hours, which ordinarily will be ample time for administering the treatment suggested'.

#### Summary

1. Cyanides are fairly commonly used in medical and public-health practice. They are frequently used in many industries and are a potential danger to the workers. A study of the problem of cyanide intoxication and the means of counteracting the condition is therefore important from the scientific, clinical and toxicological view-points.

2. The comparative efficiency of sodium thiosulphate, sodium nitrite, methylene blue and



combinations of nitrite and methylene blue with sodium thiosulphate was tested in experimentally-induced cyanide poisoning of rabbits and dogs. Sodium nitrite is the best antidote under such conditions. Methylene blue is useful in dogs but not in rabbits. Combination of antidotes is always an advantage.

3. The mechanism of action of the antidotes was investigated. The ultimate detoxification of cyanide appears to be due to conversion into thiocyanate. Nearly the whole of NaCN injected can be accounted for quantitatively as SCN within a period of four to seven days. Judging from the curve of thiocyanate formation in the blood serum of dogs, sodium nitrite and methylene blue do not seem to exert their antidotal action through the same mechanism of cyanmethæmoglobin formation, as has been suggested by some workers. The presence of sodium thiosulphate tends to accelerate thiocyanate formation.

4. The choice of an antidote in clinical cyanide poisoning must lie between  $\text{NaNO}_2$  and methylene blue. Further experience only can decide which one to advocate in regular practice.

5. Cyanide poisoning is not as hopeless a condition as is generally believed. It is possible to save many lives by prompt treatment.

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THE PRESENCE OF *ANOPHELES SUNDAICUS* ('*LUDLOWI*') ON THE CHILKA LAKE

By R. SENIOR WHITE, F.R.S.E.

Malariaologist, Bengal-Nagpur Railway

THE Bengal-Nagpur Railway has six stations on its east coast line adjacent to the Chilka Lake. Whilst these stations have never had too good a reputation as regards malaria, we have no records of anything really serious until the assistant surgeon at Khurda Road junction, within whose jurisdiction these stations lie, reported a violent epidemic at one of them, Balugan, last August. By the time this section of the medical department arrived for investigation, the epidemic was apparently over, and all we found for study was its aftermath.

One hundred and seventy-six children in the town of Balugan had a spleen rate of 72.7 per cent. In 51 railway staff and their families the parasite rate was 43.1 per cent. The only anophelines we were able to capture in the railway quarters on 30th August, 1936, were *Anopheles subpictus* (2 ♂ 15 ♀), *A. vagus* (4 ♀) and *A. annularis* (3 ♀). It was therefore obvious that whatever species had been responsible for the outbreak, it had ceased to breed by the time the epidemic was reported to us.

Though the full force of the epidemic had apparently fallen on Balugan, at least one other station had been affected, for the spleen rate of Sabilia village adjacent to Rambha station, at the south end of the lake, which had been taken by the writer on 30th September, 1935, and found to be 7.5 per cent only, was found on 25th August, 1936, to have risen to 37.2 per cent. Here again the adult catch indicated that we were too late to have found the carrier, for it consisted of *A. subpictus* (17 ♂ 42 ♀), *A. vagus* (12 ♀), and *A. culicifacies* (3 ♀) only.

Almost immediately afterwards the same assistant surgeon reported a similar outbreak at Puri, a place generally considered to be entirely malaria free. Investigation showed that the outbreak was entirely confined to the vicinity of the station, and affected neither the railway hotel on the beach, nor the town itself. The spleen rate of the children of the railway staff was 34.6 per cent, and the parasite rate of the employees and their families was 41.1 per cent, indicating that the outbreak was not yet

over. This was confirmed by dissections of catches made on 11th and 24th September which resulted in the following findings (♀ only):

*A. culicifacies*—24, *A. annularis*—19, *A. pallidus*—1, *A. subpictus*—15, *A. vagus*—20, *A. hyrcanus*—5. Of these two *annularis* were found infected, one with oöcysts and the other with sporozoites. Being a seaside place, the *subpictus* were most carefully scrutinized, but were undoubtedly only that species.

Subsequent enquiries revealed that both the Balugan and Puri outbreaks had started before the monsoon and that it was a matter of common local knowledge that the usual 'fever season' on the lake occurred before the rains, commencing in March or April, and terminated with their onset. This was to us a new phenomenon regarding malaria in the area of this country served by this railway. It was therefore decided to start routine investigations into some of these lake-side stations from January 1937, and to keep Puri under continuous observation. But, the sub-assistant malaria inspector (investigations) was instructed not to fill up the Barraud boxes despatched to the Calcutta laboratory with the *subpictus* group, but to send all other anophelines.

At the end of March of this year the writer halted on tour on the lake to look over the work of the sub-assistant malaria inspector, who was furnishing a monthly larval collection from four of these stations, as well as the adult catches for dissection. Meeting the malaria inspector of the east coast section on the spot, he was informed that epidemics, accompanied by deaths, had already broken out in some of the lake-side villages. A series of spleen rates clearly proved this to be a fact.

*Sabilia village*, at Rambha, previously referred to, has now the following splenic history:—

Date	No. examined	Nil	1 f.b.	2 f.b.	3 f.b.	4 f.b.	Umb.	Rate per cent
30-9-35	40	37	2	1	0	0	0	7.5
25-8-36	192	140	27	14	5	3	3	37.2
31-3-37	116	49	14	17	16	16	4	57.8

This village is situated right on the lake margin.

*Kespur village*, situated on the lake margin, adjacent to Kallikota station, gave the following really startling figures. Unfortunately no earlier records for this village are available.

Date	No. examined	Nil	1 f.b.	2 f.b.	3 f.b.	4 f.b.	Umb.	> Umb.	Rate per cent
1-4-37	120	9	11	13	29	18	35	5	92.5

Whilst moving over the section from Rambha to Kallikota we noticed a small village situated at a point where the hills descend directly into

(Continued from previous page)

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the lake, with no irrigable land between the hill foot and foreshore. Visiting this we found :—

*Konakar village*

Date	No. examined	Nil	1 fb.	2 fb.	3 fb.	4 fb.	Umb.	> Umb.	Rate per cent
31-3-37 ..	59	5	4	15	18	6	9	2	91.5

*Bahugan*, on the other hand, the station north of Kallikota, has not yet been infected this year. The spleen rate on 1st April, 1937, was 25 per cent only, but the Puri district board have been treating this town since the outbreak of last year, and the findings are therefore not comparable. At Konakar we were only able to search one house (Ooriyas are peculiarly sensitive to this procedure) but this yielded *A. annularis* 1 ♂ 6 ♀, *A. culicifacies* 1 ♀, *A. subpictus* 5 ♀ and *A. sundaicus* 1 ♀

The following morning, at Kallikota station, the railway quarters yielded :—

*A. hyrcanus* 1 ♀, *A. vagus* 5 ♀, *A. subpictus* 24 ♂, 24 ♀, and *A. sundaicus* 1 ♂ 8 ♀.

My laboratory assistant was therefore sent to Sabilia village, at Rambha, to make an extensive catch. The greatest difficulty was, as usual, experienced in getting into houses. In fact it was found impossible to penetrate into the inner, darker rooms of the houses. A four-hours' search of the front rooms of forty houses produced (females only) *A. culicifacies* 2, *A. annularis* 4, *A. ramsayi* [? *A. pseudo-jamesi* —Ed.] 2, *A. subpictus* 99, *A. vagus* 7, and *A. sundaicus* 19. All of the collection was dissected (even the *subpictus*) but no infected mosquitoes were found. In the face of an obvious epidemic, and the high infection rates usual to *sundaicus*, this is extraordinary.

Further, the breeding places of *sundaicus* have not yet been located. The Chilka Lake, at this season especially, is covered for several hundred feet from shore (there is no tide) with masses of alga formed into plaques by *Lyngbya aestuarii* (Biswas, 1932), among which *subpictus*-like larvæ can be found at densities up to 200 per dip. Prior to this discovery all had been entered on the monthly survey records as *subpictus*. During my visit we collected about 100 pupæ each from Kallikota and Rambha, but all bred out as *subpictus*, and much further work on this point is necessary before we can be certain that *sundaicus* is not breeding in the lake. An interesting point emerged. In spite of this very dense breeding pupæ were rare. Two collectors worked for three hours at the former place to get 100 pupæ. The cause of this mortality between the larval and pupal stage obviously merits careful investigation.

Is this invasion of the Chilka Lake by *sundaicus* a recent happening, or has the species been there but escaped detection for many years?

Fry (1912) specifically states 'My second visit (in January 1912) 'was to look for *Pm. ludlowi* in consequence of Christophers' observations in the Andamans, but I found none'. Annandale and Kemp (1915), whose faunistic studies make the lake one of the best investigated areas in the East, state 'the only mosquito larvæ we were able to find in the lake were those of *A. rossi*, Giles, which were abundant among weeds off Barkul in February and July in water of specific gravity 1.0075 to 1.008, and also off Nalbano in September in fresh water'. They comment on the absence of *ludlowi*, and state that their identification of *rossi* was confirmed by Christophers. Sewell and Annandale (1922) state: '*Anopheles rossi*, Giles, as in 1914, was the only mosquito found breeding in the lake in 1919-20'.

Sarathy (1932) states 'From the manner in which the spleen rate diminishes rapidly as one proceeds from the shores of Chilka Lake into the interior, it would be reasonable to suspect that the lake was responsible for the output of carrier mosquitoes. As the lake is a brackish-water lake, the author suspected that there could be the possibility of *A. ludlowi* playing some part in this connection. The studies carried out here show that although apparently Chilka Lake and its foreshore pools were favourable for *A. ludlowi* breeding, no specimens of *A. ludlowi* were seen anywhere in the area'. The late Mr. M. K. P. Sarathy was at this time working in the area on the field side of the malaria transmission enquiry of Col. Knowles and the present writer under the Research Fund. He was, owing to the closure of the field side of the work, only on the lake in the second half of the year, when possibly *sundaicus* is much less prevalent than in the dry season with its higher salinities. None the less it seems probable that *A. sundaicus* was not in the lake area as late as 1931. Perhaps a clue can be obtained from a study of the splenic composition of the two most affected villages, with a spleen rate of over 90 per cent. Here we find no less than 30.9 per cent of 165 enlarged spleens are down to the umbilicus or beyond. I have extracted at random from my spleen-index register the corresponding values for six hyperendemic villages (spleen rate over 90 per cent) ranging from Korea State to the Jeypore Hills. Here we find that out of 173 enlarged spleens only 20.2 per cent have this degree of enlargement, with the mode at 67.6 per cent between three and four fingerbreadths. Of course the question of race is involved, aborigines of various tribes in one case and Ooriyas in the other, the latter having no racial immunity, such as Bagster Wilson and M. Wilson (1937) have shown to exist in the case of the pre-Dravidian races of this country.

The evidence so far obtained would appear to me to suggest that *sundaicus* arrived, or at

(Continued at foot of opposite page)

## AFFECTIONS OF THE EYE IN THE MALARIAL FEVERS AND KALA-AZAR

By R. E. WRIGHT, C.I.E.

LIEUTENANT-COLONEL, I.M.S.

Professor of Ophthalmology, Madras, India

IT must not be assumed from the title that my intention is to give a sort of key to various pathological conditions occurring in the eye, either in association with, or academically still more important, actually due to an infection with the various types of parasites responsible

(Continued from previous page)

least bred in numbers for the first time, on the Chilka Lake in 1936, causing the Balugan epidemic of that year, probably equally affecting Kallikota, and to some extent affecting Rambha last year, and more so this year. It would not yet appear to be universally distributed along the lake, as the spleen rate of Chatrapur village near Gangadharpur station, north of Balugan, is at present only 36.5 per cent (all small degrees of enlargement and mostly soft). Thus Kallikota, without any nearby medical aid to the village, would relapse on to high degrees of enlargement throughout the autumn of 1936, and the present epidemic would cause the splenic composition now found. All this is highly speculative. The present note is frankly only preliminary, to advise those engaged in public health work in the new province of Orissa of the serious situation that confronts them, and malaria workers in general of the fascinating problem that this invasion presents for study. My own studies on that part of the lake adjacent to the railway will be continued and augmented by more frequent dissections, and by studies of the breeding places, when these are discovered, but the problem as a whole merits a whole-time investigation extending all over the 350 square miles of the lake.

In conclusion I have to thank Dr. M. O. T. Iyengar, medical entomologist to the Government of Bengal, for confirming my identification of the species, a finding so pregnant with possibilities of evil that a 'second opinion' seemed undoubtedly called for.

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for the diseases named. This article is intended to be, on the contrary, rather of a general nature, offering negative rather than positive information, in the hope that it will provoke those who have the time and opportunity for clinical research to produce something more definite, supported by figures of statistical value, and associated with a careful review of the literature.

My own impression after a long experience of ophthalmological work in a part of the country where malaria is fairly common, kala-azar much less so, is that we are very rarely entitled to speak of conjunctivitis, keratitis, uveitis, iritis, neuritis, or any other 'itis' connected with the eye, as due to these affections.

In the Government Ophthalmic Hospital, Madras, we have not made a diagnosis of a malarial origin in eye affections more often than once in 50,000 times. I do not deny that one may meet with retinal hæmorrhages and vitreous opacities more frequently than this in malaria and kala-azar. These, on rare occasions, may be very extensive if associated with a severe infection and a heavy parasite count so that it is almost safe to assume that the small retinal vessels are actually injured by the presence of the parasites and their toxins, and that endothelial damage, capillary embolism, and rupture of smaller vessels occur; although apart altogether from this mode of causation the hæmorrhage may be the result of anæmia induced by the infection. At times we have looked with hopeful suspicion on the malaria associated with an ophthalmic lesion—when we felt we must blame some agent and had not enough evidence to blame any—but have had sufficient honesty to avoid labelling the eye condition malarial, realizing that the wish was father to the thought.

In holding the views expressed above, I may be making a mistake, but the onus of proof lies with those who regard malaria as a condition which should be seriously considered by the eye specialist as productive of ocular diseases. One is familiar with a suffusion of the conjunctival and sub-conjunctival tissues in the fever of these affections, but it is hardly reasonable to refer to it as conjunctivitis of malarial or kala-azar origin. Such congestion of the membrane is met with in many fevers. Herpes febrilis is met with in association with malaria—more particularly in Europeans—but it is an independent disease.

Some of the varieties of keratitis supposed to be due to malaria have probably been diagnosed in complete ignorance of the existence of other potential causes. The keratitis disciformis referred to by writers in connection with malaria, is just as likely to be a variety of the disease which I have labelled elsewhere, 'keratoconjunctivitis diversiformis et uveitis anterior' (this embraces the superficial punctate keratitis group of the textbooks). It is a world-wide

	Total number examined	GOLDFEDER'S SIGN +			REMARKS
		Both eyes	One eye	Total	
Males .. .. .	45	12	19	31	Not observed in any case below 10 years.
Females .. .. .	22	3	5	8	
Children below 10 years ..	15	..	..	..	
TOTAL ..	82	15	24	39	

### *Quinine amblyopia*

J. Sedan (1929) describes a case of temporary blindness from retinal angiospasm of malarial origin. (In this report, there is a strong suggestion that the ætiological agent was quinine.) The case recorded is probably one of mistaken diagnosis and is typical of the confusion which has existed in the minds of observers in connection with eye disease and malaria, where the *post hoc* fallacy has been freely exploited.

Ghosh (1936) reports a case of cerebral malaria causing persistent loss of sight in which a quinine ætiology cannot be excluded.

This quinine amaurosis is so well recognized in India and elsewhere that it is unnecessary to detail its features. The number of cases recorded in the literature rather tends to give one an exaggerated idea of its incidence, e.g., Duggan and Nanavati (1931).

Scardapane (1930) reports 7 cases of quinine amblyopia.

In 1931, I corresponded with my late friend and colleague Lieut.-Col. H. Acton on this subject and now see from his letters that he had not observed an instance in 900 European cases treated in 1918-19 by quinine salts (using at least 20 grains daily), nor had he seen an instance in any case under his treatment up to the date of his letter, January 1931 (by which time his experience was much larger).

Drs. Narayana Iyer and Sakharan Rao did not observe any case of quinine amaurosis in 1,961 Indian patients treated by quinine in the Agency Tracts.

Since 1920, the year of publication of Elliot's *Tropical Ophthalmology*, I have not seen more than 20 cases. It is met with as an idiosyncrasy. I have seen it occur after the ingestion of seven grains of the sulphate, whereas it may not occur after 60 grains. Whether massive doses would always produce a quinine amaurosis, we have no opportunity of knowing. I once saw a case in consultation with Dr. W. T. Lawrence of the s.s. 'Orama' in which 405 grains of the bisulphate was taken at a single dose by a female patient. The following is a brief extract from his notes:—

'The onset was with coma, passing into delirium; complete loss of vision, hearing almost nil, vomiting, urine loaded with albumin. A diagnosis was made of acute nephritis; then the

discovery of quinine ingestion. Loss of vision complete for seven days, subsequent improvement to the extent of seeing outlines, then to seeing shadows of persons moving. She could not focus, or take hold of any article or avoid objects when walking. At this stage you saw her, approximately ten days after the onset. She returned to work in 26 days, but even then had to be assisted about the ship. The pupils were still dilated and the eyes could not follow quick movements of the hand. A full ten days after we got home (under two months from the date of onset), she still clung to her friends' arms, but she could then write a letter successfully'.

Duggan and Nanavati (1929) have drawn attention to more cases in ophthalmic literature than other Indian observers, but the condition is probably no more common in the Bombay Presidency than elsewhere. The ophthalmic specialist naturally has a greater opportunity of seeing cases and his experience does not represent the true incidence. If we take into consideration the enormous number of instances in which quinine is exhibited in India, year in, year out, and remember that except possibly in enormous doses (a single dose of over 1 drachm) it is a matter of idiosyncrasy, the incidence is very low. Even so, it must be infinitely more common than malarial ischæmia, if such a condition actually does exist. Presumably, nowadays the condition would be best treated by nitrosceleran like other ischæmic conditions of the retina and optic nerve since acetylcholine does not appear to be as valuable as was anticipated.

Turning for a moment to kala-azar, we do not see many cases of kala-azar in Madras, but in those I have examined there were no pathological eye changes. Presumably the position is very similar to that in the case of malaria, but there is much less information available. Ling (1924) and Lee (1924) described retinal hæmorrhages in kala-azar in Peking and Central China. The latter author saw four instances in 140 cases. In 1931, I asked for Dr. Napier's opinion in this connection. He kindly wrote and told me that there did not appear to be any constant lesions and that retinal hæmorrhage—the most frequent finding—was relatively uncommon, occurring in only about 2 or 3 per cent of cases. Kirwan examined his cases



to retinal hæmorrhage, his experience agreed with that of Fischer who found the cause of the hæmorrhage to be the blocking of vessels with malarial parasites'.

Four of his cases also showed optic neuritis. He had seen seven cases of optic neuritis without hæmorrhage and two cases of post-neuritic atrophy which both gave a negative Wassermann reaction.

Villard (1930) reports conjunctivitis, deep keratitis, true malarial iritis in hæmorrhages of the vitreous rare, choroiditis not uncommon, spasm of the retinal vessels and retinal hæmorrhages, and neuritis not so rare.

Krol (1931) in an analysis of 404 optic atrophies gives the following figures:—

'Among 42,980 patients who were examined from 1925 to 1929 inclusive, 404 or 0.94 per cent were suffering from optic nerve atrophies. The prevalent causes of these atrophies were syphilis 37.4 per cent, meningitis 11.1 per cent and trauma 9.8 per cent. Of interest is the relatively high incidence of optic nerve atrophies following acute infectious diseases; malaria in 2.2 per cent, recurrent fever 1.2 per cent, and typhoid fever in 0.95 per cent'.

Esteban (1932) records 2,000 cases of malaria with one instance of neuritis.

Motegi (1934) describes the eye changes in 100 cases of malaria. In this series, 54 presented fundus changes (small hæmorrhages in 11).

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Bulach's report (1936) deals with an epidemic of malaria in Dagesban in 1933, which was characterized by frequent ocular complications. In six weeks, he observed 20 cases of keratitis and 7 of retinal hæmorrhages (three of these had neuritis). Two showed metastatic ophthalmia, one of which ended in panophthalmitis.

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Elliot writing in 1920 found 'the greatest difficulty in satisfying himself that malaria attacks the eye at all'.

Recently, an opportunity occurred of making a clinical investigation in the Madras Agency Tracts said to have a case incidence per mille of over 75. In 1934, a member of my staff Dr. P. A. Narayana Iyer was posted there. He undertook the task of making careful observations on the condition of the eyes in malaria. It was of course impossible for him to pursue his study to the exclusion of other ætiological agents, but his findings are of interest. He had considerable difficulty in persuading many of the primitive types he examined to permit an ophthalmoscopic examination under a mydriatic, but

eventually 75 cases of well-marked chronic malaria were dealt with. The diagnosis was not always confirmed by blood examination, but the enlarged spleen (in a district where kala-azar is rare), the cachexia, the history, the type of fever, and the response to quinine therapy, left little doubt in the observer's mind as to the nature of the patient's ailment. In these 75 cases, he 'could not detect any pathological conditions of the external eye or fundus, except in two'. One of these showed lenticular opacities, the other a choroiditis. In the latter, there were many septic conditions present and syphilis could not be excluded. Dr. Narayana Iyer doubts—and I think rightly—if the conditions present in these two were directly related to the malaria.

In 1936, Dr. N. Saktharam Rao, another member of the staff of this hospital, carried out a similar investigation in the Agency Tracts. In this heavily-infected population, only those with undoubted clinical evidences were selected. He examined in all 178 cases and at the time of his first report was not able to attribute any of the pathological eye conditions found to malaria. He says 'In two cases old hæmorrhages were seen; one was Kahn positive, the other Kahn negative. Three cases showed post-neuritic atrophy; all were Kahn positive. Corneal complications were seen in eight cases; all had trachoma. Five cases had retinitis pigmentosa and 33 keratomalacia (with xerosis, night blindness, etc.)'. He uses the term keratomalacia as we always do in the Government Ophthalmic Hospital, Madras, as synonymous with a clinically-predominant avitaminosis 'A'.

Later on, Dr. Saktharam Rao made a special investigation in connection with Goldfeder's sign (see above). He writes 'I have been able to examine 82 cases of chronic malaria for the symptom of malarial eye blood vessels described by Goldfeder. For this purpose I have selected cases with a history of malaria for three years and over and enlargement of spleen of two fingers or more'.

His observations show that, in chronic malaria, vessels such as Goldfeder describes are met with, but since they are also met with in some eyes unassociated with malaria, the sign cannot logically be considered as evidence of malaria. In this connection, the following figures by Dr. Narayanaswami Naidu of the staff of the Government Ophthalmic Hospital, Madras, are of interest:—

March, 1937. One hundred cases examined in which there was no evidence or history of malaria. Sixty males and forty females. Two males and one female showed vessels such as Goldfeder describes.

It is well known that the angiospasm due to quinine hypersensitivity and its sequelæ have frequently been mistaken for a manifestation of malaria.



affection occurring sporadically and epidermically, but for the most part misdiagnosed in many of its phases. Inside the last ten years, we have seen over 13,000 cases in Madras city and districts. It is a disease *sui generis* into the ætiology of which we need not go now, but neither the existence of this condition, as such, nor the ætiology of herpes febrilis were known to Elliot when he published his *Tropical Ophthalmology* in 1920 in which he discusses keratitis in malaria. I hesitate to deny the existence of iritis in malaria and kala-azar, but in view of the fact that many of the observations on which its existence were founded preceded the use of the corneal microscope, the matter needs careful investigation under the conditions of a modern experimental enquiry. No doubt iritis has been observed in patients suffering from malarial fever, but the records on which the ætiological rôle of the malarial parasite is assumed can hardly bear critical investigation. Cyclitis and cyclitic pain in this connection must be distinguished from ciliary congestion, and the pain associated therewith, and minor attacks of increased tension. The optic 'neuritis' said to be due to these fevers no doubt may appear to exist at times, but hardly as an inflammatory condition. Here our poor terminology helps out the individual anxious to add malaria and kala-azar to the several dumps into which we gladly throw a diagnosis of neuritis, when we know nothing about its ætiology, but get the lead of a clinical association. It would be foolish to deny that a hæmorrhage into the nerve may take place in malaria or kala-azar, or that a localized ischæmia in the nerve may give rise to retrobulbar-group signs and symptoms. It is obvious that the nerve may look red and swollen in an acute attack of ague; it may even do so after homatropin instillation to an extent sufficient to deceive anyone but an expert. A real neuritis with evidences of the various criteria of inflammation—*e.g.*, a drop in the vision and subsequent healing by scar tissue with partial atrophy of the nerve fibres—is so uncommon in association with active malaria and kala-azar as to afford a reasonable presumption that these diseases are either not a cause of neuritis or only so on very rare occasions.

The line of thought which I have tried to develop above is reversed by Goldfeder (1936), who diagnoses latent and chronic malaria by means of the distribution of peculiar conjunctival vessels. He considers that the presence of certain types of vessels are as pathognomonic of malaria as Hutchinson's teeth are for congenital syphilis. I can hardly subscribe to his views, as vessels so similar as to be indistinguishable are to be seen in persons who have never had malaria, but of this more below. There are of course numbers of observers who believe that malaria is a cause of eye disease. Dedimos (1932) suggests that malaria attacks

practically all the structures of the eye and the nerves connected therewith. In the acute form lesions of the cornea predominate, whereas in the more chronic form lesions of the retina and choroid predominate. He is careful to add that it is not always easy to prove the relationship between the ocular lesion and malaria. The co-existence of the two is not sufficient. In general, the ocular lesion can be attributed to malaria only under certain conditions:—

(1) The periodic appearance or aggravation of the condition.

(2) The therapeutic influence of quinine.

(3) The presence in the blood of plasmodium-fragmented red cells or pigment-containing leucocytes, an increase in the mononuclear lymphocytes during the chronic stages, and enlargement of the spleen.

The severe forms of malaria with ocular complications are in the majority of instances due to the malignant tertian species and almost always with involvement of the nervous system. Prognosis is, as a rule, favourable. Treatment depends wholly on the use of quinine.

Pereyra (1922) considers that three types of corneal affection, dendritic, herpetic, and interstitial keratitis, as well as conjunctivitis, iritis and choroiditis, may be due to malaria. The nerve may also show a number of changes the most common of which are (1) simple hyperæmia, (2) papillitis, (3) retrobulbar neuritis, (4) acute endocular neuritis, (5) neuro-retinitis, and (6) atrophy, which in all cases is secondary to inflammatory process. The retina may show pigmentary changes, the result of chorio-retinitis and endarteritis of small vessels and may even be ruptured by pathologic adhesion between retina and vitreous. The author is specially interested in retinal hæmorrhages on account of having seen a number of cases and having had the opportunity to examine the eyes of one post mortem.

Kiep (1922) attributes the following to malaria. 'Dendritic or herpetic keratitis, deep-seated central parenchymatous keratitis, retinal and pre-retinal hæmorrhages, optic neuritis generally accompanied by retinal hæmorrhages and paresis or paralysis of the seventh cranial nerve. He has not been able to decide that neuritis is caused by malaria. Of 63 cases of herpetic keratitis 43 gave no history of previous ocular trouble. The ocular conditions might arise the same day as the initial malarial attack or long afterwards. In his experience, it was invariably unilateral and arose from various forms of the plasmodium. In all four cases of parenchymatous keratitis, the Wassermann was negative. There was no other evidence of syphilis and the keratitis was always unilateral. In each case the benign tertian fever was found. The progress of keratitis was slow, its duration averaging three months, and central permanent opacity of the cornea was left. With reference

to retinal hæmorrhage, his experience agreed with that of Fischer who found the cause of the hæmorrhage to be the blocking of vessels with malarial parasites'.

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His observations show that, in chronic malaria, vessels such as Goldfeder describes are met with, but since they are also met with in some eyes unassociated with malaria, the sign cannot logically be considered as evidence of malaria. In this connection, the following figures by Dr. Narayanaswami Naidu of the staff of the Government Ophthalmic Hospital, Madras, are of interest:—

March, 1937. One hundred cases examined in which there was no evidence or history of malaria. Sixty males and forty females. Two males and one female showed vessels such as Goldfeder describes.

It is well known that the angiospasm due to quinine hypersensitivity and its sequelæ have frequently been mistaken for a manifestation of malaria.

	Total number examined	GOLDFEDER'S SIGN +			REMARKS
		Both eyes	One eye	Total	
Males .. .. .	45	12	19	31	Not observed in any case below 10 years.
Females .. .. .	22	3	5	8	
Children below 10 years ..	15	..	..	..	
TOTAL ..	82	15	24	39	

### *Quinine amblyopia*

J. Sedan (1929) describes a case of temporary blindness from retinal angiospasm of malarial origin. (In this report, there is a strong suggestion that the ætiological agent was quinine.) The case recorded is probably one of mistaken diagnosis and is typical of the confusion which has existed in the minds of observers in connection with eye disease and malaria, where the *post hoc* fallacy has been freely exploited.

Ghosh (1936) reports a case of cerebral malaria causing persistent loss of sight in which a quinine ætiology cannot be excluded.

This quinine amaurosis is so well recognized in India and elsewhere that it is unnecessary to detail its features. The number of cases recorded in the literature rather tends to give one an exaggerated idea of its incidence, *e.g.*, Duggan and Nanavati (1931).

Scardapane (1930) reports 7 cases of quinine amblyopia.

In 1931, I corresponded with my late friend and colleague Lieut.-Col. H. Acton on this subject and now see from his letters that he had not observed an instance in 900 European cases treated in 1918-19 by quinine salts (using at least 20 grains daily), nor had he seen an instance in any case under his treatment up to the date of his letter, January 1931 (by which time his experience was much larger).

Drs. Narayana Iyer and Sakharan Rao did not observe any case of quinine amaurosis in 1,961 Indian patients treated by quinine in the Agency Tracts.

Since 1920, the year of publication of Elliot's *Tropical Ophthalmology*, I have not seen more than 20 cases. It is met with as an idiosyncrasy. I have seen it occur after the ingestion of seven grains of the sulphate, whereas it may not occur after 60 grains. Whether massive doses would always produce a quinine amaurosis, we have no opportunity of knowing. I once saw a case in consultation with Dr. W. T. Lawrence of the s.s. 'Orama' in which 405 grains of the bisulphate was taken at a single dose by a female patient. The following is a brief extract from his notes:—

'The onset was with coma, passing into delirium; complete loss of vision; hearing almost nil, vomiting, urine loaded with albumin. A diagnosis was made of acute nephritis; then the

discovery of quinine ingestion. Loss of vision complete for seven days, subsequent improvement to the extent of seeing outlines, then to seeing shadows of persons moving. She could not focus, or take hold of any article or avoid objects when walking. At this stage you saw her, approximately ten days after the onset. She returned to work in 26 days, but even then had to be assisted about the ship. The pupils were still dilated and the eyes could not follow quick movements of the hand. A full ten days after we got home (under two months from the date of onset), she still clung to her friends' arms, but she could then write a letter successfully'.

Duggan and Nanavati (1929) have drawn attention to more cases in ophthalmic literature than other Indian observers, but the condition is probably no more common in the Bombay Presidency than elsewhere. The ophthalmic specialist naturally has a greater opportunity of seeing cases and his experience does not represent the true incidence. If we take into consideration the enormous number of instances in which quinine is exhibited in India, year in, year out, and remember that except possibly in enormous doses (a single dose of over 1 drachm) it is a matter of idiosyncrasy, the incidence is very low. Even so, it must be infinitely more common than malarial ischæmia, if such a condition actually does exist. Presumably, nowadays the condition would be best treated by nitroscleran like other ischæmic conditions of the retina and optic nerve since acetylcholine does not appear to be as valuable as was anticipated.

Turning for a moment to kala-azar, we do not see many cases of kala-azar in Madras, but in those I have examined there were no pathological eye changes. Presumably the position is very similar to that in the case of malaria, but there is much less information available. Ling (1924) and Lee (1924) described retinal hæmorrhages in kala-azar in Peking and Central China. The latter author saw four instances in 140 cases. In 1931, I asked for Dr. Napier's opinion in this connection. He kindly wrote and told me that there did not appear to be any constant lesions and that retinal hæmorrhage—the most frequent finding—was relatively uncommon, occurring in only about 2 or 3 per cent of cases. Kirwan examined his cases

so that expert opinion supported his view. As a great deal of work has been done on kala-azar in Calcutta since then, we may expect further detail on the subject. Meantime we are led to assume that kala-azar is not of greater ætiological importance than malaria in the production of eye affections.

The position to-day in India as regards the ophthalmological importance of these two diseases does not seem to be very different to that in 1920 when Elliot published his *Tropical Ophthalmology*. Retinal hæmorrhages are met with in both, in fact hæmorrhage into the posterior segment of the eye appears to be the only associated pathological condition which is not viewed with scepticism by observers who have had considerable opportunity of judging. Other conditions described require considerably more scientific support in order to confirm their existence. Even the posterior-segment hæmorrhages are possibly rather more dependent on the severity of the anæmia than the severity of the toxæmia, although there is some evidence that a heavy crescent invasion is more likely to be associated with retinal hæmorrhages apart from the degree of anæmia. Malarial keratitis, which was regarded as a distinct possibility in India years ago, is now looked upon much more doubtfully. We have learnt a great deal about corneal diseases in the last 16 years and now know enough to place some of the varieties of keratitis, formerly called malarial, in their correct ætiological position.

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## A Mirror of Hospital Practice

PYREXIA SIMULATING THAT OF ENTERIC FEVER CAUSED BY *PS. PYOCYANEUS* IN CHILDREN

By D. N. CHAKRAVARTI

MAJOR, I.M.S.

and

NITYA NAND TYAGI, I.M.D.

(From the Brigade Laboratory, Allahabad)

Two cases of fever in children with pyocyanus infection are noted. In both, abdominal symptoms, distension, tympanitis, and general toxæmia were well marked, but neither showed signs of meningism. Both looked rather dull and apathetic. No rash was present and both recovered after prolonged pyrexia lasting 50 to 60 days.

Case 1.—B., aged 3½ years, admitted to hospital on 15th June, 1936, complaining of parotitis and fever, duration two days. On admission the temperature was normal; both the parotids were swollen and painful. Symptomatic treatment relieved this condition.

Ten days later the temperature was 99°F. A gradual 'staircase' rise in temperature followed, reaching 104°F. on 28th June. From 28th June to 8th July he had continuous temperature ranging between 104°F. and

100.2°F. followed by a period of irregular temperature, often hectic in nature, until 4th August (41st day after the onset of pyrexia). The temperature then settled down but again went up on 16th August and continued for 10 days. The temperature during the relapse was hectic in nature often showing a difference of over 4° between the maximum and minimum.

The condition of the patient during the period of continuous pyrexia and relapse caused great anxiety, severe toxæmia being the predominant feature. The pulse throughout the illness did not show signs of bradycardia.

*Ps. pyocyanus* was isolated from blood on 30th June and from faeces on 11th July.

Serum agglutination test against the homologous organism gave a titre of 1/25 only. No agglutination was noted against the enteric or proteus group of organisms.

Ehrlich's diazo reaction on 11th July was negative.

Case 2.—V., aged 7 years, suffered from continuous temperature for five weeks, which then became normal and remained so for seven days, followed by a relapse of continuous pyrexia for three weeks, the maximum and minimum temperatures recorded being 105.8°F. and 100°F., respectively. Pulse corresponded with the temperature. Abdominal distension was the marked feature. Child was dull and apathetic and often delirious. Headache, although it persisted throughout, was never distressing. Slight anorexia was noted. Tongue was moist but coated on dorsum and comparatively clean at the tip. Skin had been dry and hot generally, twice during the course of the disease (16th

and 27th days) she perspired profusely and appeared to be collapsing.

Blood smears were examined thrice (3rd, 4th and 12th days) and were negative for malaria parasites and leishmania. Differential count showed slight polymorphonuclear leucocytosis.

From stool and urine: during third and fourth weeks, *Ps. pyocyaneus* was isolated in almost pure culture on four occasions.

Diazo reaction was repeatedly negative.

Russo's test was doubtful twice during the third week and negative at other times.

### GANGRENE OF THE CERVIX UTERI\*

By MURARI MOHAN ROY, L.M.F., L.T.M.

Medical Officer, Barda Jnanadamayee Charitable Dispensary, District Howrah

A MULTIPARA was brought to me with the following history: she had suffered from prolapse of the uterus for the past six years, and had had a successful pregnancy three years ago. After delivery of the child the uterus was so prolapsed that it had protruded from the vagina. The woman apparently put up with this condition until recently when the protruding cervix was roughly pushed back into the vagina by a *dai*. This caused her severe pain so she consulted me.

She complained of great pain in the lower abdomen and back and had an attack of shivering. Her temperature was 99°F., pulse 84 and respirations 18 per minute. I considered the pain was probably caused by the rough handling to which she had been subjected. I prescribed an alkaline mixture and another containing small doses of quinine and tincture of perchloride of iron.

Two days later the woman was delivered of a child followed by the placenta in the normal manner. A few hours later another structure was found to have escaped from the vagina which the *dai* could not identify so I was called to see the patient. I examined the placenta which had been preserved and found it to be complete, and I identified the second body as the dilated cervix which was apparently gangrenous and had sloughed off. It was about the size of a tennis ball. There was considerable hæmorrhage and a foul discharge from the vagina. The woman's pulse was 122 per minute and thready so I prescribed brandy and ordered four ounces of glucose to be given by the mouth during the next twenty-four hours.

The second day her pulse was much better and the temperature was normal. As a prophylactic measure an injection of 10 c.cm. of polyvalent antistreptococcal serum was given. No local treatment such as douching was given for fear of spreading the infection into the uterus, and all the subsequent treatment consisted of a second injection of antistreptococcal serum and a simple mixture by mouth; the external genitals were cleaned with weak lysol. The woman made a complete and remarkable recovery.

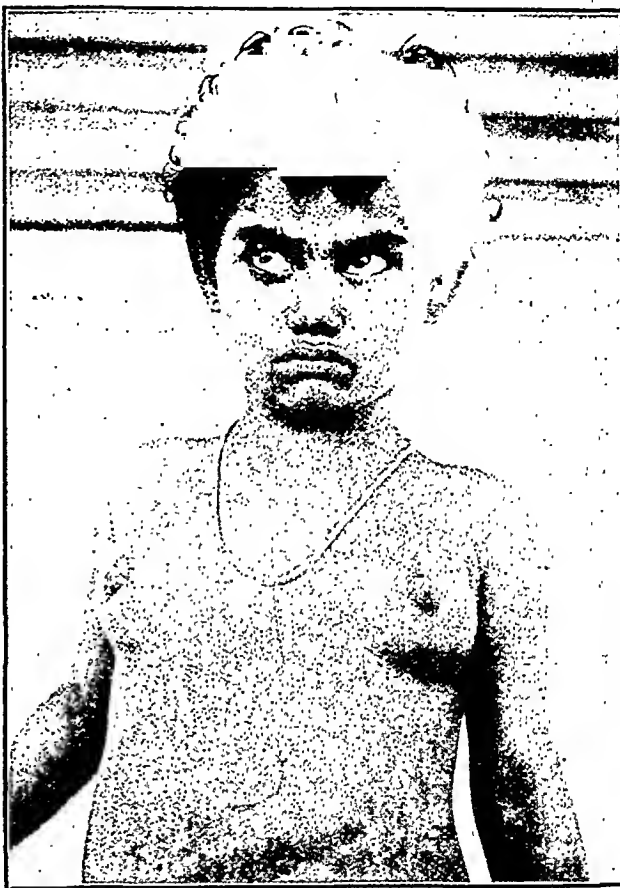
### MENSTRUATION AT THE AGE OF 3½ YEARS

By P. M. SEN GUPTA

Resident Medical Officer, The Tata Iron and Steel Company, Limited, Jamshedpur

ABOUT a year ago I was called to attend a girl aged about 4 years. She was said to have

been bleeding from the vagina almost every month. The bleeding continued for four or five days and stopped without treatment. I prescribed a lotion for external use and an alkaline mixture and calcium lactate powder for internal administration. I enquired from the father of the child now and then about the girl and requested him to keep me informed of the progress of the case. The following are the details:—



She started menstruating at the age of 3½ years. At first the flow came on every month, then the intermenstrual periods lengthened to about two months and the last interval was over six months. She was fed with glaxo biscuits when she was 6 months old and she continued taking them for about two years. Her father noticed slight enlargement of the breasts when she was only two years of age.

There was no history of specific disease in her family. The girl had an attack of enteric fever complicated with broncho-pneumonia about eight months back.

*Present state of health.*—Good.

The breasts are considerably developed, and there is slight growth of pubic and axillary hair. Her voice is not much altered. She is at present 5 years' old and is quite intelligent.

*Liver and spleen.*—Not enlarged.

No enlargement of thyroid, tonsils or any other glands.

*Heart and lungs.*—Normal.

I wish to thank Dr. L. R. Khan for taking the photograph.

\* Rearranged by Editor.



# Indian Medical Gazette

JUNE

## TREATMENT OF ANÆMIA

THREE outstanding practical results have been the outcome of the great revival in the study of the anæmias that has taken place during the last ten years: conversely, it is these practical results that have been the main stimulus in this hæmatological renaissance, as academic advances without practical results seldom stir the popular imagination, which in the long run dictates, directly or indirectly, the lines along which medical research shall be directed. These three practical results in the treatment of anæmia are the use of—(a) liver and stomach and the various extracts prepared from these organs, (b) massive doses of iron, and (c) autolysed yeast and other substances that contain a specific substance usually referred to as the 'extrinsic factor'.

The work of these last ten years has done much more than simply add thus to the list of therapeutic substances for the treatment of anæmia; it has indicated very clearly the particular types of anæmia in which each substance should be used, and has led to a new classification of the anæmias and to considerable advances in the methods of diagnosis. Thus, it has been shown that liver extract is a 'specific' in the treatment of pernicious anæmia only, on account of the presence in it of a substance, a specific 'hæmopoietic principle' which the pernicious anæmia patient is unable to synthesize, and it has further been shown that though liver extract by virtue of its content of other substances, e.g., the extrinsic factor, is of value in other forms of anæmia, its action in these is not truly specific, nor in them is it the only substance that will effect improvement, as it is in the case of pernicious anæmia.

Massive doses of iron on the other hand have a specific action only in microcytic hypochromic anæmias, and, though in other anæmias—pernicious and tropical macrocytic—there may be some associated iron deficiency which requires the inclusion of iron in the treatment regimen, there will be a negligible response if iron is given alone. Amongst the microcytic anæmias are the true secondary anæmias due to blood loss from any cause, e.g., hookworm infection, piles, bleeding peptic ulcer; in these conditions massive doses of iron will cause a rapid increase in hæmoglobin amounting to as much as 2 grammes per 100 c.c.m. of blood per week (about 2 per cent on the Haldane scale per day) with the characteristic sharp reticulocyte crisis about the fifth day. In these conditions liver

therapy with the refined extracts will have a negligible action whilst whole liver and the less refined liver extracts, by virtue of their high iron content, will produce some slow improvement but without any increase of reticulocytes.

Finally, autolysed yeast and other substances containing the 'extrinsic factor' only exert their specific action in one type of anæmia (or perhaps in view of its ill-defined nature we should refer to it as a group of anæmias), which is macrocytic and hyperchromic, is usually not associated with achlorhydria, is more common in tropical countries, and occurs in both sexes but more frequently in pregnant women. In this anæmia, which for want of a better name we call tropical macrocytic anæmia, iron has no action whatsoever and though liver extract on account of the contained 'extrinsic factor' will effect a cure, autolysed yeast—a convenient form of which is sold under the name of marmite—is equally efficacious and very much less expensive.

Mr. Coleman, the originator of the well-known mustard, is once reported to have said that he did not make his fortune from the mustard people eat, but from the mustard that they leave on their plates. It might equally be said, of the pharmaceutical firms that supply liver extract, that they make most of their profits from the liver extract that is given to patients suffering from microcytic iron-deficiency anæmia. It is not at all uncommon in the out-patient department at the School of Tropical Medicine to see patients with microcytic anæmia who have spent all their savings on expensive liver extract preparations when all that was required to restore them to a state of normal health was about three-annas worth of ferrous sulphate tablets.

Medical treatment in this country where the expenditure under this heading is only a few annas per head of population is an economic problem almost as much as a medical one. In most communities in India the microcytic anæmias far exceed the macrocytic. In a paper included in our last issue, it was shown that in an unselected group of 41 anæmic tea-garden coolies 39 responded in a remarkable manner to large doses of iron (18 grains of ferrous sulphate a day). The proportion of iron-deficiency anæmias in this community is undoubtedly exceptionally high, but we have seen no reports of unselected series of anæmia patients in India where the microcytic anæmias did not predominate.

Again, Addisonian pernicious anæmia is exceedingly rare in India; in the vast majority of the macrocytic anæmias that are encountered there is no evidence of the absence of the 'intrinsic factor', and liver or liver extract is therefore very seldom specifically indicated, though in actual practice, in certain cases in which absorption from the intestinal tract is



slow, liver extract given parenterally will produce a result when substances containing the 'extrinsic factor', given by mouth, will not.

The argument may be put forward that the majority of practitioners in this country are not in a position even to do a blood count on their patients, much less to estimate accurately the size of the corpuscles. Cell-volume estimations are valuable but not always essential; the hypochromic case, i.e., the case with a low mean corpuscular hæmoglobin and a low colour index, is nearly always microcytic as well. In the absence of blood counts the practitioner will have to depend on his clinical sense in distinguishing the two types of anæmia from one another—this is by no means easy and we are not even prepared to admit that it is possible to do it with any degree of accuracy—or on therapeutic trial.

The point that we are trying to emphasize is that the order in which the therapeutic agencies should be tried is the order of the frequency of occurrence of the types of anæmia in which they are specifically indicated, namely, iron (for microcytic anæmia), autolysed yeast (for tropical macrocytic anæmia), and liver extract (for pernicious anæmia). It is very fortunate that this happens to be the order of preference from an economic as well as from a medical point of view.

To summarize, in a case of anæmia of unknown nature, treatment by ferrous sulphate in doses of 6 grains three times a day should first be prescribed; this should be given a trial for at least a fortnight, by which time, in a case of iron-deficiency anæmia, definite clinical improvement will be noted; if there is definite improvement the iron should be continued for a further week and then, if necessary, after a short interval another three-weeks' course given.

If there is no improvement marmite, or some other autolysed-yeast preparation, should be given in doses of at least 6 drachms a day. And if this is without appreciable effect within a fortnight, one of the numerous preparations of liver extract may then be given, preferably by intramuscular injection.

Both iron and autolysed yeast can be given at the same time, if strict economy is not a matter of primary importance and the anæmia is severe, but this will be done at the sacrifice of accuracy in diagnosis.

## NOTICE

Dr. H. E. C. Wilson's paper 'Diet and Public Health in India' read at the Public Health Society on the 21st April, 1937, which was to have been included in this number, has been held over on account of shortage of space. It will, however, appear in the July number.—Editor, I.M.G.

## Medical News

### MEDICAL COUNCIL OF INDIA

AN intimation has been received from the Registrar of the General Medical Council of Great Britain to the effect that the medical qualifications of the Punjab University have been recognized with effect from 25th February, 1930. These qualifications were recognized only up to 24th February, 1930. The significance of the retrospective effect to this notice is that now there will be no gap in the recognition of these qualifications by the General Medical Council.

The Executive Committee of the General Medical Council have deferred their decision on the recognition of the medical qualifications of the Universities of Calcutta and Rangoon till their next meeting on 24th May, 1937.

### INDIAN SCIENCE CONGRESS ASSOCIATION 25TH (JUBILEE) CONGRESS

THE 25th Session of the Indian Science Congress will be held at Calcutta from the 3rd to the 9th January, 1938.

The subscription should be sent to the Honorary Treasurer, Indian Science Congress Association, 1, Park Street, Calcutta.

Papers should be sent to the sectional presidents so as to reach them by the 15th of August, 1937, at the latest. They should be accompanied by three typed copies of an abstract which should not exceed 200 words, and should not contain any diagrams.

Papers published or submitted for publication elsewhere will not be accepted.

In accordance with the rules of the Association only ordinary and full session members have the right to contribute papers for reading at the session of the Congress. Associate and student members must have their papers communicated by an ordinary member. In the case of joint papers, each author must be a member of some category.

Under the new rules the abstracts will be printed in final bound form before the meeting. The executive committee have decided that no abstracts will be printed unless accompanied by the full paper at the time of submission. This rule will be strictly enforced.

In addition to the reading of papers, it is hoped to arrange some general discussions. Suggestions regarding suitable subjects for discussion will be welcome, and should be sent at a very early date. Abstracts of what members intend to say at such discussions should reach the sectional presidents by the 1st October, 1937.

#### Sectional Presidents

Medical Research—Sir Upendra Nath Brahmachari, Kt., 82/3, Cornwallis Street, Calcutta.

Physiology—Brevet-Colonel R. N. Chopra, C.I.E., K.H.P., I.M.S., School of Tropical Medicine, Calcutta.

### UNITED PROVINCES MEDICAL COUNCIL

(Extract from the minutes of the meeting of the United Provinces Medical Council held at Lucknow on 20th March, 1937)

The Registrar's suggestions (i) that the medical register should be maintained on the lines of the British Medical Register without segregation of names in different parts, (ii) that it should be published annually at the government central press who should keep the type standing year after year, (iii) that it should have no indexes, and (iv) that its free supply to doctors registered free, under the principle of reciprocity, be discontinued, were considered and it was decided that—

(i) the list should be published biennially, without supplements, and that inquiries about the cost of printing and whether the type can be kept standing be made from the government central press.

(ii) that free supply of lists to doctors registered free, under the principle of reciprocity, should be discontinued.

Resolved that the name of Dr. Deva Datta, L.M.P., which was removed by the late Registrar under section 17(2) for want of correct address be restored.

Amendments of sections 20 and 20(b) of the United Provinces Medical Act were considered and it was resolved that the following should be substituted for paragraph 1 of section 20:

'The Council shall have power to call on the governing body or authorities of a medical college or school, other than those inspected under the Medical Council of India Act, included in or desirous of being included in the schedules';

and that section 20(b) should be amended as below:

'20(b). To provide facilities to enable members of the Council deputed by the Council in this behalf to be present at the examinations of medical schools situated in the United Provinces to judge of the standard of teaching'.

The following resolution was passed:

'This Council recommends to the Government that the restrictions placed on certain classes of registered medical practitioners in the United Provinces in the matter of granting and acceptance of their medical certificates under the fundamental rules be removed and that certificates of all registered medical practitioners, whether in private practice or government employ, be placed on a basis of equality, and that instructions to this effect be circulated to various departments in these provinces. The following resolution was passed:

'As it is expedient that there should be an uniform minimum standard of medical education throughout United Provinces which would conform to that prescribed by the Indian Medical Council, the United Provinces Medical Council unanimously resolves that—

(i) the pre-medical qualification required for admission at the Agra Medical School be raised from Matriculation to I.Sc.

(ii) the period of study for obtaining the minimum registrable qualification be raised from four to five years'.

Government Medical Department notification nominating Rai Bahadur Dr. K. P. Mathur, M.A.C.S., L.R.C.P., D.P.H., Director of Public Health, United Provinces, as a member of the Medical Council was read and recorded.

Government Medical Department notification nominating Lieut.-Colonel J. A. S. Phillips, C.I.E., L.R.C.P., D.P.H., I.M.S., Inspector-General of Civil Hospitals, United Provinces, as President of the Medical Council was read and recorded.

### INDIAN MEDICAL CORONATION HONOURS, 1937

THE following are the names of medical men and others, associated with medical institutions, in the Indian Honours List of date 11th May, 1937. We offer them our congratulations:

#### C.B.

Major-General W. H. Hamilton, Deputy Director of Medical Services, Northern Command.

#### C.I.E.

Colonel J. Taylor, Director-General, Central Research Institute, Kasauli.

Lieutenant-Colonel C. Newcombe, Chemical Examiner to the Government of Madras, and Principal, Medical College, Madras.

Lieutenant-Colonel R. D. Candy, Civil Surgeon, Poona.

Mr. E. Muir, General and Medical Secretary, British Empire Leprosy Relief Association.

#### Kaisar-i-Hind Medal (First Class)

Mrs. Broomfield, Honorary General Secretary, Bombay Branch, Indian Red Cross Society, Bombay.

Reverend Mother Marie du Divan Paraclet, Franciscan Sisters, Mother Superior-in-charge of Rangoon Leper Asylum and Bishop Bigandet Home for Incurables, Burma.

Miss Margaret Edith Rawson, Superintendent, Lady Reading Health School, Delhi.

Mr. Jehangir Ardeshir Anklesaria, Port Health Officer, Rangoon.

#### O.B.E.

Major G. M. Moffat, Civil Surgeon, Lashio, Northern Shan States, Burma.

Lieutenant-Colonel John Rodeer, Chief Medical Officer in Bahelistan.

Lieutenant-Colonel P. H. S. Smith, Superintendent, Central Jail, Haripur (Hazara).

#### Diwan Bahadur

Mr. Janardhan Shankar Nerurkar, Executive Health Officer, Bombay Municipality.

#### Khan Bahadur

Mr. Abdul Hamid, Assistant Director of Public Health (Hygiene Publicity Bureau).

Khan Sahib Muhammad Bashir, Clinical Assistant to the Professor of Ophthalmology, King Edward Medical College, Lahore.

#### Rai Bahadur

Rai Sahib Kalyan Singh, Sub-Assistant Surgeon and Jail Superintendent, Pagan, Burma.

Rai Sahib Sachindra Nanda Banerjee, Assistant Surgeon, E. I. Railway, Jamalpur.

Rai Sahib Ambalal Motilal Mahadevia, Chief Medical Officer, Jaora State, Central India.

#### Rao Bahadur

Sitaram Ayyar Padmanabhai Sarma Avargal, District Medical Officer, South Arcot, Madras Presidency.

#### Vaidyaratna

Sardar Narinjan Singh Sethi, District Medical Officer of Health, Lahore.

Mr. Kapoor Singh, Senior Sub-Assistant Surgeon, Civil Hospital, Mayanaung, Henzada District, Burma.

Jemadar Sapuran Singh, Sub-Assistant Surgeon, Residency Dispensary, Kashmir.

#### Khan Sahib

Mr. Abdul Nasir Sarfraz Khan, Bombay Subordinate Medical Service, Officer in charge of the Agricultural College Dispensary, Poona.

#### Rai Sahib

Babu Pramatha Nath De, Medical Practitioner, Malda, Bengal.

Babu Sanatan Pujari, Professor of Anatomy, Prince of Wales Medical College, Patna.

Mr. Satya Charan Barat, General Practitioner, Jubbulpore.

Mr. Harsukh Rai, Civil Assistant Surgeon, Irwin Hospital, Delhi.

Mr. Arnest Satyendra Mohan Chandra, State Surgeon, Kurwai, Central India.

#### Rao Sahib

Rama Kurup Anantan Pillai Avargal, District Health Officer, Madras.

Palakamchetti Parthasarathy Nayndu Garu, Civil Assistant Surgeon (Retired), Madras.

Bhaskara Gopalayya Krishnan Avargal, Civil Sub-Assistant Surgeon, Madras Presidency.

Ambal Narayana Menon Avargal, Private Medical Practitioner, Madura.

Mr. Govind Krishnaji Raje, Dental Surgeon, Bombay.

Rayarotli Kariandy Narayan Nair Avargal, Sub-Assistant Surgeon, Nowrangpur, Koraput, Orissa.

Mr. Maneklal Ravishankar Ghoda, Assistant Medical Officer, Bombay Baroda and Central India Railway, Bandikui.

slow, liver extract given parenterally will produce a result when substances containing the 'extrinsic factor', given by mouth, will not.

The argument may be put forward that the majority of practitioners in this country are not in a position even to do a blood count on their patients, much less to estimate accurately the size of the corpuscles. Cell-volume estimations are valuable but not always essential; the hypochromic case, *i.e.*, the case with a low mean corpuscular hæmoglobin and a low colour index, is nearly always microcytic as well. In the absence of blood counts the practitioner will have to depend on his clinical sense in distinguishing the two types of anæmia from one another—this is by no means easy and we are not even prepared to admit that it is possible to do it with any degree of accuracy—or on therapeutic trial.

The point that we are trying to emphasize is that the order in which the therapeutic agencies should be tried is the order of the frequency of occurrence of the types of anæmia in which they are specifically indicated, namely, iron (for microcytic anæmia), autolysed yeast (for tropical macrocytic anæmia), and liver extract (for pernicious anæmia). It is very fortunate that this happens to be the order of preference from an economic as well as from a medical point of view.

To summarize, in a case of anæmia of unknown nature, treatment by ferrous sulphate in doses of 6 grains three times a day should first be prescribed; this should be given a trial for at least a fortnight, by which time, in a case of iron-deficiency anæmia, definite clinical improvement will be noted; if there is definite improvement the iron should be continued for a further week and then, if necessary, after a short interval another three-weeks' course given.

If there is no improvement marmite, or some other autolysed-yeast preparation, should be given in doses of at least 6 drachms a day. And if this is without appreciable effect within a fortnight, one of the numerous preparations of liver extract may then be given, preferably by intramuscular injection.

Both iron and autolysed yeast can be given at the same time, if strict economy is not a matter of primary importance and the anæmia is severe, but this will be done at the sacrifice of accuracy in diagnosis.

## NOTICE

Dr. H. E. C. Wilson's paper 'Diet and Public Health in India' read at the Public Health Society on the 21st April, 1937, which was to have been included in this number, has been held over on account of shortage of space. It will, however, appear in the July number.—Editor, *I.M.G.*

## Medical News

### MEDICAL COUNCIL OF INDIA

An intimation has been received from the Registrar of the General Medical Council of Great Britain to the effect that the medical qualifications of the Punjab University have been recognized with effect from 25th February, 1930. These qualifications were recognized only up to 24th February, 1930. The significance of the retrospective effect to this notice is that now there will be no gap in the recognition of these qualifications by the General Medical Council.

The Executive Committee of the General Medical Council have deferred their decision on the recognition of the medical qualifications of the Universities of Calcutta and Rangoon till their next meeting on 24th May, 1937.

### INDIAN SCIENCE CONGRESS ASSOCIATION 25TH (JUBILEE) CONGRESS

The 25th Session of the Indian Science Congress will be held at Calcutta from the 3rd to the 9th January, 1938.

The subscription should be sent to the Honorary Treasurer, Indian Science Congress Association, 1, Park Street, Calcutta.

Papers should be sent to the sectional presidents so as to reach them by the 15th of August, 1937, at the latest. They should be accompanied by three typed copies of an abstract which should not exceed 200 words, and should not contain any diagrams.

Papers published or submitted for publication elsewhere will not be accepted.

In accordance with the rules of the Association only ordinary and full session members have the right to contribute papers for reading at the session of the Congress. Associate and student members must have their papers communicated by an ordinary member. In the case of joint papers, each author must be a member of some category.

Under the new rules the abstracts will be printed in final bound form before the meeting. The executive committee have decided that no abstracts will be printed unless accompanied by the full paper at the time of submission. This rule will be strictly enforced.

In addition to the reading of papers, it is hoped to arrange some general discussions. Suggestions regarding suitable subjects for discussion will be welcome, and should be sent at a very early date. Abstracts of what members intend to say at such discussions should reach the sectional presidents by the 1st October, 1937.

#### Sectional Presidents

Medical Research—Sir Upendra Nath Brahmachari, Kt., 82/3, Cornwallis Street, Calcutta.

Physiology—Brevet-Colonel R. N. Chopra, G.I.E., K.H.F., I.M.S., School of Tropical Medicine, Calcutta.

### UNITED PROVINCES MEDICAL COUNCIL

(Extract from the minutes of the meeting of the United Provinces Medical Council held at Lucknow on 20th March, 1937)

The Registrar's suggestions (i) that the medical register should be maintained on the lines of the British Medical Register without segregation of names in different parts, (ii) that it should be published annually at the government central press who should keep the type standing year after year, (iii) that it should have no indexes, and (iv) that its free supply to doctors registered free, under the principle of reciprocity, be discontinued, were considered and it was decided that—

(i) the list should be published biennially, without supplements, and that inquiries about the cost of printing and whether the type can be kept standing be made from the government central press.

(ii) that free supply of lists to doctors registered free, under the principle of reciprocity, should be discontinued.

Resolved that the name of Dr. Deva Datta, D.M.P., which was removed by the late Registrar under section 17(2) for want of correct address be restored.

Amendments of sections 20 and 20(b) of the United Provinces Medical Act were considered and it was resolved that the following should be substituted for paragraph 1 of section 20:

'The Council shall have power to call on the governing body or authorities of a medical college or school, other than those inspected under the Medical Council of India Act, included in or desirous of being included in the schedules';

and that section 20(b) should be amended as below:

'20(b). To provide facilities to enable members of the Council deputed by the Council in this behalf to be present at the examinations of medical schools situated in the United Provinces to judge of the standard of teaching'.

The following resolution was passed:

'This Council recommends to the Government that the restrictions placed on certain classes of registered medical practitioners in the United Provinces in the matter of granting and acceptance of their medical certificates under the fundamental rules be removed and that certificates of all registered medical practitioners, whether in private practice or government employ, be placed on a basis of equality, and that instructions to this effect be circulated to various departments in these provinces. The following resolution was passed:

'As it is expedient that there should be an uniform minimum standard of medical education throughout United Provinces which would conform to that prescribed by the Indian Medical Council, the United Provinces Medical Council unanimously resolves that—

(i) the pre-medical qualification required for admission at the Agra Medical School be raised from Matriculation to I.Sc.

(ii) the period of study for obtaining the minimum registrable qualification be raised from four to five years'.

Government Medical Department notification nominating Rai Bahadur Dr. K. P. Mathur, M.R.C.S., L.R.C.P., D.P.H., Director of Public Health, United Provinces, as a member of the Medical Council was read and recorded.

Government Medical Department notification nominating Lieut.-Colonel J. A. S. Phillips, C.I.E., L.R.C.P., D.P.H., I.M.S., Inspector-General of Civil Hospitals, United Provinces, as President of the Medical Council was read and recorded.

### INDIAN MEDICAL CORONATION HONOURS, 1937

THE following are the names of medical men and others, associated with medical institutions, in the Indian Honours List of date 11th May, 1937. We offer them our congratulations:

#### C.B.

Major-General W. H. Hamilton, Deputy Director of Medical Services, Northern Command.

#### C.I.E.

Colonel J. Taylor, Director-General, Central Research Institute, Kasauli.

Lieutenant-Colonel C. Newcombe, Chemical Examiner to the Government of Madras, and Principal, Medical College, Madras.

Lieutenant-Colonel R. D. Candy, Civil Surgeon, Poona.

Mr. E. Muir, General and Medical Secretary, British Empire Leprosy Relief Association.

#### Kaiser-i-Hind Medal (First Class)

Mrs. Broomfield, Honorary General Secretary, Bombay Branch, Indian Red Cross Society, Bombay.

Reverend Mother Marie du Divan Paraclet, Franciscan Sisters, Mother Superior-in-charge of Rangoon Leper Asylum and Bishop Bigandet Home for Incurables, Burma.

Miss Margaret Edith Rawson, Superintendent, Lady Reading Health School, Delhi.

Mr. Jchangir Ardeshir Anklesaria, Port Health Officer, Rangoon.

#### O.B.E.

Major G. M. Moffat, Civil Surgeon, Lashio, Northern Shan States, Burma.

Lieutenant-Colonel John Rodeer, Chief Medical Officer in Baluchistan.

Lieutenant-Colonel P. H. S. Smith, Superintendent, Central Jail, Haripur (Hazara).

#### Divan Bahadur

Mr. Janardhan Shankar Nemurkar, Executive Health Officer, Bombay Municipality.

#### Khan Bahadur

Mr. Abdul Hamid, Assistant Director of Public Health (Hygiene Publicity Bureau).

Khan Sahib Muhammad Bashir, Clinical Assistant to the Professor of Ophthalmology, King Edward Medical College, Lahore.

#### Rai Bahadur

Rai Sahib Kalyan Singh, Sub-Assistant Surgeon and Jail Superintendent, Pagan, Burma.

Rai Sahib Sachindra Nanda Baujerja, Assistant Surgeon, E. I. Railway, Jamalpur.

Rai Sahib Ambalal Motilal Mahadevia, Chief Medical Officer, Jaora State, Central India.

#### Rao Bahadur

Sitaram Ayyar Padmanabhai Sarma Avargal, District Medical Officer, South Arcot, Madras Presidency.

#### Vaidyaratna

Sardar Narinjan Singh Sethi, District Medical Officer of Health, Lahore.

Mr. Kapoor Singh, Senior Sub-Assistant Surgeon, Civil Hospital, Mayanaung, Henzada District, Burma.

Jemadar Sapuran Singh, Sub-Assistant Surgeon, Residency Dispensary, Kashmir.

#### Khan Sahib

Mr. Abdul Nasir Sarfraz Khan, Bombay Subordinate Medical Service, Officer in charge of the Agricultural College Dispensary, Poona.

#### Rai Sahib

Babu Pramatha Nath De, Medical Practitioner, Malda, Bengal.

Babu Sanatan Pujari, Professor of Anatomy, Prince of Wales Medical College, Patna.

Mr. Satya Charan Barat, General Practitioner, Jubbulpore.

Mr. Harsukh Rai, Civil Assistant Surgeon, Irwin Hospital, Delhi.

Mr. Arnest Satyendra Mohan Chandra, State Surgeon, Kurwai, Central India.

#### Rao Sahib

Rama Kurup Anantan Pillai Avargal, District Health Officer, Madras.

Palakamchetti Parthasarathy Nayudu Garu, Civil Assistant Surgeon (Retired), Madras.

Bhaskara Gopalayya Krishnan Avargal, Civil Sub-Assistant Surgeon, Madras Presidency.

Ambal Nanyana Menon Avargal, Private Medical Practitioner, Madura.

Mr. Govind Krishnaji Raje, Dental Surgeon, Bombay.

Rayarotti Kariandy Narayan Nair Avargal, Sub-Assistant Surgeon, Nowrangpur, Koraput, Orissa.

Mr. Maneklal Ravishankar Ghoda, Assistant Medical Officer, Bombay Baroda and Central India Railway, Bandikui.

## Current Topics

### Diet Surveys in South Indian Villages

By W. R. AYKROYD

and

B. G. KRISHNAN

(Abstracted from the *Indian Journal of Medical Research*, Vol. XXIV, January 1937, p. 667)

It is often said that the diet of the Indian villager or ryot is insufficient in quantity and poor in quality. On the other hand, statements are made that the average villager, in spite of his manifest poverty, has enough 'good wholesome food' to maintain health and strength, and that the diet of the poor in towns and cities is much more deficient. The general impressions of untrained observers on such points are, however, of doubtful value, and very little exact information, collected by systematic surveys, is available about the diet of Indian peasants. Since some 80 per cent of the population live in villages such information is essential if the problem of nutrition in India is to be defined and understood, and its collection is one of the most important objects of nutrition research.

McCay (1912) gives the composition of 'average diets' consumed by various classes of the population in Bengal, including cultivators, and also that of an 'average' Sikh diet. The dietaries of industrial workers in India have been investigated in family-budget inquiries carried out by the Labour Office of the Government of Bombay (1923, 1928a and b, 1935) and by the Commerce Department of the Government of Bengal (1930); the purpose of these investigations was, however, economic, and no attempt was made to assess the physiological adequacy of the diets. Wilson, Ahmad and Mullick (1936) have recently made a detailed study of the diet of a few families in Calcutta. The Board of Economic Inquiry, Punjab (1928), has published an economic survey of a village in the Amritsar district in which some rough data about the food intake of a few families are included; it is possible that the reports of economic inquiries carried out elsewhere in the country contain similar data. Nicholls (1936) has reported the results of an investigation of the diet of 16 Ceylonese families of the labouring classes, and a similar but more detailed inquiry, extending over a year and including 15 families of peasants and 5 families of working men, has been carried out in Java (Ochese *et al.*, 1934). Surveys in adjacent countries where dietary habits are roughly similar are of interest to nutrition workers in India.

#### SCOPE AND METHOD OF THE PRESENT INQUIRY

The diet of 44 families including 274 persons was investigated over a period of 20 days. Of these, eight were Christian families, engaged in cultivation and coolie work, living in a small village near Chingleput in South-East Madras. Four Hindu families, distinctly more prosperous, living in a neighbouring village, were included in this survey which took place in January 1936. A larger inquiry, comprising 32 families, was organized in a number of small villages in the neighbourhood of Mayanur, about 36 miles north-west of Trichinopoly; this inquiry took place in July and August 1936. Twenty-nine of these were engaged in agriculture or ancillary village occupations, with some coolie work of various kinds. The occupations of the remainder were as follows: clerk in the Public Works Department; agricultural instructor at a Rural Reconstruction Centre; owner of a provision store.

#### ECONOMIC STATUS

To arrive at a satisfactory assessment of the economic position of any group of peasant families, it would be necessary to collect data about all sources of income, indebtedness, taxes, the amount of live stock and other

property owned, etc. Indian village economy is complicated, and its detailed study lies outside the scope of nutrition research. An attempt was nevertheless made, in the present investigation, to assess gross income very roughly, in terms of the value of crops produced and wages obtained for coolie work and other labour.

Group I was the poorest of the four. The families in this group were tenants with an average holding of 3 acres of land per household, for which rent was paid in cash and produce to the value of Rs. 3 per acre per annum. Average annual income in this group may be roughly reckoned as between Rs. 50 and Rs. 80 per family (with the exception of one more prosperous family).

Group II consisted of families of a distinctly more prosperous order. The total income of family 1 in this group, derived from the father's occupation as school teacher and postmaster as well as from agriculture, exceeded Rs. 1,000 per annum. In the other three families, annual income lay between Rs. 200 and Rs. 300.

Group III included families of different income and economic status, and may perhaps be regarded as a cross section of a village community. At the upper limit, we may place a Brahmin family owning 10 acres of wet land, and a considerable quantity of live stock, whose annual income may be reckoned as Rs. 300; at the lower, families supported by coolie work, leasing an acre or so of dry land, and owning one or two head of cattle, with a gross annual income under Rs. 100. Average family income in this group was somewhat higher than in group I, being in the neighbourhood of Rs. 100 per annum. The incomes of group IV lay between Rs. 350 and Rs. 500.

Most of the families owned some live stock including cows and she-buffaloes. During the period of investigation, however, the out-turn of milk was very small, and a number of families sold a high proportion of whatever milk was produced. Only one or two families owned sheep and goats; goat's milk was not consumed at all. Poultry were unimportant as a source of income or food.

#### DISCUSSION

How far are the diets of the various families sufficient in quantity? It is of little use to compare observed calorie intake with 'generally accepted standards', since such standards are European or American in origin. Only four families out of 44 consumed the 3,000 calories per consumption unit which are traditionally the requirement of 'an average man at average work'.

The families in group I had not enough to eat. We know this, because they told us so. A complaint of hunger is perhaps better evidence of insufficient calorie intake than a textbook deduction. Average calorie intake in this group per consumption unit per family was 1,664; range 2,026 to 1,184. We may, therefore, take it that the daily calorie requirements of groups of South Indian village families assessed in terms of the conventional scale used here, exceed the mean intake of this group.

Two facts regarding these families may be mentioned in passing. We were informed that they displayed 'an obvious lack of energy and initiative' which scarcely seems remarkable in the circumstances. Sometime after the inquiry the missionary who kindly co-operated wrote: 'I have been finding a condition of oedema in very young children and have come to the conclusion that it is due to excess of crude salt. The salt is not cooked in the rice but sprinkled over it when the rice is being eaten. These children have improved at once when salt-free diet has been given'. It is possible that these children had a tendency towards oedema related to the 'hunger' or 'famine' oedema so commonly observed in Central and Eastern Europe during and just after the war.

The mean calorie intake of group III is obviously no guide to the requirements of South Indian population groups, since the series included families with 'hungry mouths'. Calorie requirements can be deduced from intake only when intake is unrestricted by poverty or



other circumstances. It is worth noting, however, that mean calorie intake in this group was greater than the mean intake (1,940) of 16 peasant families studied by Nicholls (*loc. cit.*) in Ceylon and that of 15 Javanese families, which was 2,116 (Ochese *et al.*, *loc. cit.*). Nicholls suggests that 'a diet of the value of about 2,200 calories is sufficient for the requirements of an agricultural labourer belonging to the smaller races of the tropics, provided the diet is well balanced in necessary constituents'.

Five families in our investigation stood out from the rest in being in the possession of an income obviously sufficient to allow appetite to dictate the amount of food intake. The calorie intake of these was as follows:—

Group II, family 1	: 2,473
Group III, " 13	: 2,453
Group IV, " 1	: 2,394
Group IV, " 2	: 2,963
Group IV, " 3	: 2,464

Mean : 2,549

The mean figure is very much below that given by Wilson *et al.* (*loc. cit.*) as average intake per 'mean value' in ten well-to-do Bengali Hindu families (3,411). These workers used Lusk's scale.

We have attempted, in a rough and ready fashion, to work out the minimum energy expenditure budget of a South Indian peasant. According to Rahman (1936) the average basal heat production per hour of a group of male students in Hyderabad was about 60 calories, some 7 to 8 per cent below American standards. Mason and Benedict (1931) recorded an average of 44 calories in 54 Indian women (students and teachers) in Madras—an average deviation from the Aub and du Bois standards of 17.2 per cent.

During sleep the metabolism rate has been reckoned as 10 per cent below the basal. Experiments on European and American subjects have shown that any form of manual labour raises metabolism at least three times above the basal, while 'sitting at rest' raises it about 1.3 times. Assuming that the South Indian peasant spends 8 hours of the 24 in sleep, 8 hours at work, and 8 hours 'sitting at rest', his energy expenditure budget would work out as follows:—

8 hours sleep at	54 calories per hour :	432 calories.
8 " work at	180 " " " :	1,440 "
8 " sitting at rest	86 " " " :	688 "

TOTAL : 2,560 "

This seems a minimum budget, since expenditure at work is reckoned at the figure corresponding to expenditure in light manual occupations (*e.g.*, carpentry). No figures are available for the energy expenditure involved by agricultural labour, but in general it has been found that agricultural labourers in Europe and America have a high calorie intake. For example, the average calorie intake per consumption unit of a series of Roumanian peasant families was found to exceed 3,000 (Aykroyd, Alexa and Nitzulescu, 1935). The item of 688 calories for 8 hours 'sitting at rest' seems also a minimum, since peasants do not occupy all the waking hours not spent at work in this fashion.

Reckoned on similar basis, the daily energy expenditure of a woman with a basal metabolism rate per hour of 45 calories would work out at 1,900 calories. No data exist about the basal metabolism of Indian children.

All things considered, we are inclined to estimate the minimum daily calorie requirements per consumption unit of South Indian peasant families as lying in the neighbourhood of 2,500. If the diet of a labourer falls much below this figure, adjustment occurs as follows: basal metabolism is reduced, the body functioning, as it were, at a lower level of vitality, and energy output

is necessarily made consonant with energy intake, since energy cannot be created. In simple terms, the under-fed labourer is lethargic and his output of work is small. A level of food intake which permits only a languid existence cannot be described as normal.

We are making use of the figure 2,500 in practical nutrition work, *e.g.*, in drawing up diet schedules for institutions. It represents, of course, an average, and all individual cases falling somewhat below it need not be regarded as under-fed. If this figure is accepted, it appears that calorie intake in groups I and II (three families in the latter group) is definitely insufficient. In group III, the mean approaches the standard minimum requirement, but conceals (since the intake of a number of families was in excess of the minimum) under-nutrition in a considerable proportion of families. The statement seems justified that one-third to one-half of the group of 44 families studied did not consume enough food during the period of investigation.

Judged by conventional standards, protein and fat intake was low. There was an almost complete absence of protein and fat of animal origin. The level of protein and fat intake in the poorer families was largely dependent on the nature of the cereal consumed, the protein and fat content of millet being higher than that of rice. The very low level of fat intake in group I is due to the fact that the diet was mainly composed of rice and insufficient in quantity. Little can be said regarding the adequacy of calcium intake, except that it falls below conventional requirements in groups II, III, and IV. The inclusion of millet, particularly ragi, in a largely cereal diet greatly raises calcium content, but Ranganathan (1935) has observed that the calcium in ragi and cambu is not well assimilated by rats. Phosphorus intake appears adequate; it is, however, to be observed that a considerable loss of phosphorus occurs on cooking from diets largely based on rice. Intake of iron appears high in relation to the general qualitative insufficiency of the diet; this may be ascribed to the fact that the iron content of many foods analysed in the laboratories has been found to be high, possibly because they originated in a district where the soil is rich in iron. The problem of iron requirements has been complicated by the observation that the iron contained in many foods is partially 'unavailable'.

Vitamin A was lacking, or present in infinitesimal quantities, in the diet of 39 of the 44 families. The highest intake, 500  $\gamma$  ( $\gamma = 0.001$  mg.) per c.u. per day was that of family 1, group IV, which consumed milk products in reasonable quantities. Carotene intake in groups I, II, and III, and vitamin-A and carotene intake in the families comprising group IV, were estimated as follows:—

Group	Mean carotene intake ( $\gamma$ per c.u. per day)	Range ( $\gamma$ )
I	669	102 to 1,052
II	632	283 to 1,363
III	828	182 to 3,544

Group	Carotene intake ( $\gamma$ per c.u. per day)	Vitamin-A intake ( $\gamma$ per c.u. per day)
IV { Family 1	440	500
" 2	1,098	200
" 3	1,400	256

Estimates of vitamin-A and carotene intake are based on spectrographic assays carried out by Mr. N. K. De in these Laboratories. They are rough estimates, particularly as regards carotene, because the carotene content of foodstuffs is influenced by many factors (De, 1936), and the foodstuffs richest in carotene—green leafy vegetables—are those the intake of which it is most difficult to record accurately in diet surveys. In a previous paper (Aykroyd and Krishnan, 1936) we described the occurrence of xerophthalmia in a high



percentage of children admitted to labour camps from a famine area, whose diet contained about 700  $\gamma$  of carotene daily. The view was expressed that this quantity is insufficient to cover the requirements of children. Bitot's spots were observed in 14 (3.8 per cent) of the group of children examined in the present investigation. We have found, in extensive investigations in children's hostels, that the percentage incidence of Bitot's spots and the apparent vitamin-A activity of the diet do not always run parallel, but in general this eye lesion appears to be associated with the consumption of a diet deficient in carotene and vitamin A. Both from the estimated quantities of these food factors consumed and the presence of xerophthalmia in the children examined, it may be concluded that the diet of the majority of families was somewhat deficient in vitamin-A activity.

Similarly, a deficiency of vitamin B<sub>2</sub> is shown by the presence of 'angular stomatitis'.

Beri-beri does not appear to be prevalent in the areas in which the surveys took place, though endemic in other parts of the Madras Presidency where raw milled rice is the chief staple. It has long been known that beri-beri is rarely or never seen in populations consuming home-pounded or milled parboiled rice, or in millet eaters. If very poorly fed village folk of the type investigated were to discard their parboiled rice or millet in favour of raw milled rice, beri-beri would doubtless soon appear. Although no signs of scurvy were observed many of the diets seem to be deficient in vitamin C.

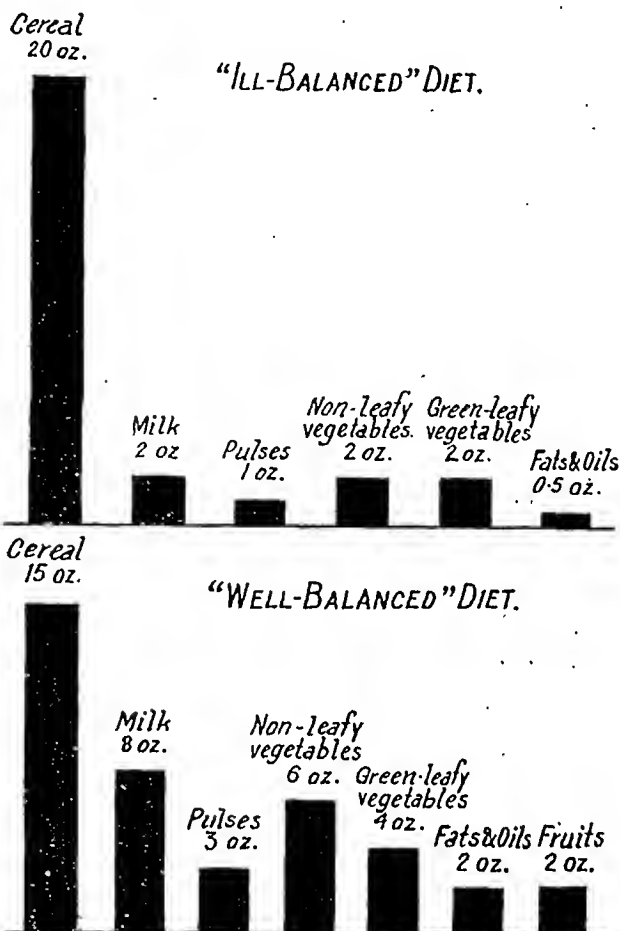
It is difficult to say how far the families studied were typical of South Indian peasants in general. To our collaborators in Chingleput and Mayanur they appeared typical of millions of village families throughout the country. It is clear that if group I, which may without exaggeration be described as half-starved, is representative of a large group, the problem of under and malnutrition in South India is more serious than has yet been realized. Variations in diet at different seasons of the year require further study. We propose to carry out investigations at other times of the year on the groups studied here or on other similar groups.

There is reason to suppose that in India malnutrition is more marked among the poor of the towns and cities than among the poor of the countryside. The incidence of symptoms of food deficiency disease in the Mayanur district boys was lower than that in Coonoor, Mettupalayam and Calicut boys, and apparently also lower than that reported in Madras Corporation schools. It is our experience that 'state of nutrition' is better when the diet is based on millet, or at least contains a fair proportion of millet, than when the only cereal eaten is milled rice, as is often the case in towns and cities. Village populations have the further advantage over town populations that, when they do consume rice, they usually consume it in roughly milled form, often parboiled. The families in group I, though they consumed home-pounded rice, were in a poor state of nutrition; their condition would be much worse if their staple cereal was highly milled. While living standards in India remain at the present level, we must view with alarm any extension of mechanical rice milling in rural areas.

Though in general the poor in the villages may suffer less severely from malnutrition than the urban poor, the present investigation emphasizes the deficiencies of the South Indian diet, notably the lack of milk and other 'protective' foods. Some months ago, a chart was prepared in the laboratory for propaganda purposes, illustrating, in terms of South Indian food habits, the difference between a 'well-balanced' and an 'ill-balanced' diet. The chart is here reproduced.

Both diets as described would yield 2,600 calories, roughly adult daily requirements; the cost of the well-balanced diet, at current retail prices, is about Rs. 5 per adult per month; that of the ill-balanced diet, about Rs. 3-8. The diet of the families studied corresponds roughly in quality to the 'ill-balanced'

diet, except that observed intake of milk and vegetables was even smaller than that shown diagrammatically. The chart may, however, be used to show the changes in agricultural production required to 'balance' the



South Indian diet. Whether, given the existing standard of living and the fact of increasing population, changes in the direction of the well-balanced diet (e.g., a larger milk supply) are possible, is a fundamental problem which nutrition and agricultural research workers in India must face.

### Use of the Dermal Parasitocides

By F. WISE, M.D.

and

J. WOLF, M.D.

(From the *Journal of the American Medical Association*, Vol. CVII, 3rd October, 1936, p. 1126)

In this article we shall confine ourselves to a discussion of the use of parasitocides in the parasitic disorders occurring in dermatologic practice. A discussion of the use of these remedies in diseases of non-parasitic origin would lead us too far afield, since it would embrace almost the entire field of dermatotherapeutics.

In the accompanying list are the most important members of the group of drugs referred to as the parasitocides. They form the basis of present-day anti-parasitic therapy. There are other remedies, some of which will be mentioned in the text, but these are purposely omitted in the list. The reasons for their use will be given. A thorough knowledge of the actions with their use is more important than the haphazard application of many. Much can be achieved by the proper combination of two or more of these medicaments by variations in their respective percentages and by the choice of the proper vehicle. For these reasons

alone, even if for none other, many proprietary remedies may be justifiably condemned.

The parasitic group of diseases forms a not inconsiderable percentage of the total number of cases seen

#### Most important parasitocides

Peruvian Balsam	Sodium Thiosulphate
Chrysarobin	Betanaphthol
Pyrogallol	Sulphur
Iodine	Resorcinol
Mercury Bichloride	Salicylic Acid
Ammoniated Mercury	Benzoic Acid
Tar	Thymol
Phenol	Oil of Cinnamon

in the practice of dermatology. Indeed, some of the members of this group probably affect a major percentage of the population of the United States. It may be said at the very outset that this fact accounts for the numerous remedies employed in the treatment of these skin conditions and also for the vast number of 'patent medicines' offered to an innocent public. The credulity of the physician is similarly attacked.

The parasitic diseases affecting man are best grouped into those caused by (a) vegetable parasites, the dermatophytes which belong primarily to the group of mucedineae or fungi imperfecti and (b) animal parasites including insects, acari and worms. While destruction of the parasite is the objective in the treatment of both, there are material differences between these two groups and each shall be considered separately.

#### VEGETABLE PARASITES

At least two fundamental considerations are to be considered before the treatment of this group of diseases can be properly undertaken: the first is the manner of the action of the parasitocides, here better called fungicides, and the second is the response of the individual to his infection.

Strictly speaking, the term fungicide is largely a misnomer. Numerous *in vitro* experiments belie the fungicidal power of most of the remedies listed, some of them even lacking fungistatic powers in high concentrations. Chrysarobin, pyrogallol, sulphur and sodium thiosulphate will not restrain growth of fungi in concentrations of 1 : 10, salicylic and benzoic acids possess fungistatic properties only in dilutions of 1 : 50 and 1 : 40 respectively, but the combination of salicylic and benzoic acids, which forms the basis of the most commonly used anti-parasitic ointment, namely, Whitfield's ointment, possesses fungistatic and fungicidal properties *in vitro* even in high dilutions. Iodine, phenol, betanaphthol and mercury bichloride are fungistatic in high dilutions and fungicidal in considerably stronger concentrations. Resorcinol, a very useful member of this group, is fungistatic in concentrations of 1 : 200 but is not fungicidal. Thymol and certain volatile oils, such as the oil of cinnamon and the oil of clove, are highly fungicidal even in low concentrations.

Clinically, there can be no question of the efficacy of these remedies. In the superficial dermatomycoses, clinical cure, with negative microscopic and cultural examinations, is easily obtained as a rule even with those drugs which are mildly fungistatic *in vitro*. An explanation of the action of these remedies must therefore be sought on other than fungicidal grounds.

These clinically active remedies possess two common qualities in varying degrees: (1) they cause exfoliation of the upper layers of the skin and (2) they produce hyperæmia when massaged into the skin. In addition, almost all of them are reducing agents. As reducing agents they may cause destruction of fungi; aerobic organisms, by depriving them of the oxygen so necessary to life. Exfoliation is produced either by a desiccant action such as that of resorcinol, in which the upper layers dry up and are cast off, or by keratolytic action such as that of salicylic acid, which causes swelling of the horny layer, which finally splits into scales and is exfoliated. In the superficial dermatomycoses the fungi living in the stratum corneum are thus cast

off with the scales, and clinical cure results without actual destruction of the fungi. Histologic examination of normal skin treated with ointments containing these fungicides shows vascular dilatation and evidence of inflammation, even though the latter may not be clinically manifest. This artificially induced inflammatory reaction may play a rôle similar to that of the natural inflammatory reactions, following infection with certain members of the ringworm group, in bringing about the death of the parasite. The latter consideration leads to the second of the two fundamental considerations; namely, the reaction of the host to the parasite.

The group of fungi calls forth responses in the human organism which place them immunologically with the bacterial group, which produces what is designated as the hypersensitivity of infection. In this bacterial group the tubercle bacillus is the best known and most studied example. This group also includes *Bacillus mallei*, *Bacillus typhosus* and *Brucella abortus*.

Trichophytin, an extract prepared from certain fungi, has been as helpful in advancing our knowledge concerning the dermatomycoses as has been tuberculin in the study of tuberculosis, and many analogies exist between the two. The most important of these are that the reaction is specific, is positive in a great percentage of adult people (in the United States) and therefore possesses only limited diagnostic value, is of the delayed type and is negative in most infants even when given in large doses. The reaction can be elicited many years after infection and this state of altered reactivity probably lasts during the lifetime of the individual.

The length of time necessary for the development of the hypersensitive state, that is, the incubation period, varies with the individual and with the type of infection. The superficial dermatomycoses may call forth very little clinical response, and the trichophytin reaction may be negative even if the eruption has persisted for a long time. In the deep, severe, acutely inflammatory, kerion type of infection on the scalp, or in the bearded region, the reaction becomes positive at the end of from ten to fourteen days and the state of hypersensitivity that is developed is sufficient to destroy the fungi and permit the infection to go on to spontaneous healing.

The secondary lesions arising at a distance from the original focus, which on direct microscopic and cultural examination are usually found to be free from fungi, have their analogy in the tuberculids and are variously termed microsporids, epidermophytids and trichophytids, depending on the nature of the organism producing the infection at the source. The 'ids' in the very acute infections, such as those of the scalp and beard, go on to spontaneous healing within a relatively short period. In the case of the mycotic infections of the feet, however, the 'id', which is almost always located on the hands and fingers, is apt to run a prolonged, recurrent, chronic course, and is also apt to be more recalcitrant to treatment than the original focus.

The foregoing, in a general way, are fundamental considerations which form a necessary background for the proper therapeutic approach to the dermatomycoses. The specific remedies that have been found most useful are best considered by a discussion of the separate disease entities.

#### RINGWORM INFECTION

The most important member of the group, since it assumes major importance from the standpoint of incidence alone, is the ringworm infection occurring on the hands and feet, the so-called athlete's foot, dermatophytosis of the hands and feet. This disease has definitely been on the increase in recent years, since people have become more sport-minded and have been exposed to the infection at golf clubs, beaches, gymnasiums and swimming pools. Dermatophytosis is looked on and classified with the superficial dermatomycoses.

There are primarily three clinical types, which, very briefly, are described as follows:

1. The interdigital variety, with scaling between the toes varying from the mild grade to the severely macerated, white, soggy epidermis, accompanied by fissuring, swelling of the toes, secondary dermatitis and pyogenic infection of the contiguous skin surfaces.

2. The acutely vesicular and vesiculobullous type, which usually appears on the sole of the foot and extends along the arch on to the dorsum of the foot. The vesicles are situated on an erythematous base; they rupture or become desiccated, leaving crusted and finally superficial erythematous areas surrounded by a scaly collarette.

3. The squamous or hyperkeratotic type, which favours the sole of the foot, the arch and the region of the ankle. The lesion is usually well circumscribed, rounded, dry, scaly and erythematous.

The interdigital type of infection usually accompanies the other two varieties. Pruritus is the most important subjective symptom. It may be mild, very severe or at times surprisingly absent. Hyperhidrosis is frequently present. Secondary infection may take place, producing lymphangitis and adenitis of the inguinal glands, which may even go on to suppuration.

Involvement of the nails is manifested by their characteristic dull, lustreless, opaque appearance. Infection may produce deformity of the nail plate, the porcelain-coloured streaks of leukonychia trichophytica or separation of the nail plate by an underlying hyperkeratosis.

There appears to be a widespread general impression that ringworm of the feet is so recalcitrant to treatment as to be considered incurable.

#### Prescriptions\*

##### PRESCRIPTION 1.—For ringworm

R Iodine .. ..	gr. xx
Salicylic acid .. ..	..
Benzoic acid .. ..	aa ʒi
Alcohol 90 per cent .. ..	ad ʒiv

##### PRESCRIPTION 2.—For ringworm

R Salicylic acid .. ..	gr. xc
Resorcinol .. ..	gr. lx
Alcohol 90 per cent .. ..	ad ʒiv

##### PRESCRIPTION 3.—For ringworm

R Thymol .. ..	gr. xxx
Oil of cinnamon .. ..	ʒ xxx
Alcohol 90 per cent .. ..	ad ʒiv

##### PRESCRIPTION 4.—For ringworm

R Thymol .. ..	gr. v
Salicylic acid .. ..	gr. xv
Alcohol 80 per cent .. ..	ʒi

##### PRESCRIPTION 5.—Whitfield's ointment (original formula)

R Benzoic acid .. ..	gr. xxv
Salicylic acid .. ..	gr. xv
Paraffin mol. .. ..	ʒii
Ol. cocois nucis .. ..	ad ʒi

##### PRESCRIPTION 7.—Ammoniated mercury ointment, U. S. P.

R Ammoniated mercury .. ..	gr. cl
Wool fat .. ..	..
White wax .. ..	aa gr. lxxx
White petrolatum .. ..	ʒiiss

##### PRESCRIPTION 8.—Sulphur ointment, U. S. P.

R Precipitated sulphur .. ..	gr. ccxl
Wool fat .. ..	..
Yellow wax .. ..	aa gr. lxxx
White petrolatum .. ..	ad ʒiii

\*The prescriptions have been altered to conform with the prescribing practice employed in India.—EDITOR.

##### PRESCRIPTION 9.—Chrysarobin ointment, U. S. P.

R Chrysarobin .. ..	gr. xc
Wool fat .. ..	..
Yellow wax .. ..	aa gr. lxxx
Chloroform .. ..	ʒi
Liquid petrolatum .. ..	ʒiiss
Petrolatum .. ..	ad ʒiii

##### PRESCRIPTION 10.—Dusting powder

R Thymol .. ..	gr. xx
Boric acid .. ..	gr. ccc
Zinc oxide .. ..	..
Talcum .. ..	..
Zinc stearate .. ..	aa ad ʒii

Sig.: Apply between toes each morning and after bath.

##### PRESCRIPTION 11.—Dusting powder

R Sodium thiosulphate .. ..	..
Thymol iodide .. ..	..
Boric acid .. ..	aa gr. cl
Lycopodium .. ..	..
Talcum .. ..	aa ad ʒii

Sig.: Apply between toes each morning and after bath.

The choice of the proper remedy diligently applied and continued in decreased concentrations long after the last vestiges of the disease have disappeared will serve to cure almost all cases. Diligence and persistence are the prerequisites of successful treatment. In the recurrent case, treatment must be instituted with the appearance of the first signs of recurrence, usually with the approach of warm weather.

For the macerated, soggy, interdigital infection and for the dyshidrotic variety, alcoholic lotions are most suitable; for the hyperkeratotic variety, ointments are most effective.

In prescriptions 1 to 11 are given time-tried, time-honoured and most useful remedies. These stand high in the list of eczematogenous substances and the possibility of sensitization to one or another of the ingredients, with an ensuing dermatitis, must always be kept in mind. The patient should be warned against continuing with the use of the remedy in case of irritation. It is most advisable to start with one-half the strength of the active ingredients as listed and gradually increase to full strength.

The 10 per cent solution of silver nitrate, so popular a decade or two ago, seems to have lost face and unfortunately so, since in the interdigital, macerated, fissured type infection it remains one of the most effective remedies.

The useful adjuvant to the various active medications listed, in every form of infection, is the hot potassium permanganate solution foot bath, about 10 grains (0.65 gm.) to the basin of hot water, the feet being soaked for one-half hour daily. In the very acute and very severe processes that incapacitate the individual and make walking impossible, soaks with potassium permanganate 1 : 2,000 or with Burow's solution diluted 1 : 15 for three or four hours daily or continuous wet dressings, with these solutions, give the greatest relief and the most rapid objective improvement.

Unless fungi can be cultivated from the lesions on the hands they are to be considered as dermatophytids and should be treated with soothing, keratoplastic and mildly stimulating remedies. The choice of the remedial agent will depend on the clinical appearance, but anti-parasitic treatment is not indicated.

For prophylaxis of ringworm of the feet, solutions of from 0.5 to 1 per cent of sodium hypochlorite are used in all adequately equipped gymnasiums, clubs and schools. Statistical studies show that the incidence of ringworm infection in these places has been materially reduced. Its use is recommended. It need hardly be added that walking barefooted is at all times to be avoided.

An approach to the treatment of ringworm of the scalp requires cultural studies and the mycologic classification of the parasite in every case. Ringworm of

the scalp is caused by the microsporon and trichophyton groups of fungi, including both the human-pathogenic and animal-pathogenic varieties. The prognosis as to cure, by the use of topical remedies alone, depends largely on whether or not the fungus is of the animal variety, since the lesions in patients infected with an animal type of ringworm tend to go on to spontaneous healing. The animal type of infection is therefore amenable to treatment with the fungicides listed later.

Infections with the human variety of parasite are more resistant to topical agents even if used over a period of many months. In order to effect a rapid cure and to prevent the inconveniences associated with the isolation of children, recourse must therefore be had, in most instances, to epilation with x-rays. In children approaching puberty, the treatment should be conservative and consist only of the application of the milder anti-parasitides, since spontaneous cure takes place at that time. (The dangers of internally administered depilating drugs, such as thallium acetate, are too great to permit their general employment.)

Repeated mycologic examinations of hair and scales and, whenever possible, examination under a Wood's filter light are necessary during the course of treatment. The patient must not be discharged from observation until repeated examinations have proved negative.

The clinical appearance of ringworm of the scalp is varied but can be roughly divided into several groups. The most common in the United States is the dusty appearing, gray, finely scaly variety with oval or rounded patches, in which the hairs are broken off, from 2 to 3 mm. in length, lustrous and lifeless in appearance. This variety is usually caused by *Microsporon audouini*. The disseminated form, with more numerous, smaller and more irregular patches, has large scales, heaped up and adherent, in which the hairs are broken off or matted between the scales. There is also a pustular variety most often produced by the ectothrix type of trichophyton. The inflammatory and suppurative processes may be mild or may be so severe as to produce large, boggy swellings with draining sinuses. The variety, known as kerion celsi, heals spontaneously and requires only mild antiseptic wet dressings and soothing remedies.

The practical therapeutic procedures consist first in isolation of the child from other children so as to prevent the transmission of the disease. Adults can be considered to be immune, although occasional adult infection does occur. The hair is to be cut short and kept short, washed with tincture of green soap daily or every other day, and the infected hairs are to be removed with epilation forceps, a few dozen at a time. A washable cap is to be worn at all times until the condition is cured. The following remedies and methods of treatment are suggested:—

1. Ten per cent iodine crystals in anhydrous wool fat. This is very effective and should be applied with a soft tooth brush morning and night. As soon as the reaction becomes severe, treatment is to be suspended for several days and then resumed.

2. Two per cent tincture of iodine dabbed on liberally morning and night.

3. The preparation given in prescription 12.

**PRESCRIPTION 12.—For ringworm of the scalp**

R Precipitated sulphur .. .. gr. xc  
Salicylic acid .. .. ʒiiss  
Castor oil .. .. gr. xlv  
Petrolatum .. .. ad ʒii  
Sig.: Massage in thoroughly morning and night.

**PRESCRIPTION 13.—For ringworm of the scalp**

R Pyrogallol .. .. aa gr. lxxx  
Salicylic acid .. .. ʒiiss  
Castor oil .. .. ʒiiss  
Petrolatum .. .. ad ʒiiss

4. The preparation given in prescription 13.

5. Chrysarobin may be substituted for pyrogallol in prescription 13, but precautions must be taken to avoid

the annoying conjunctivitis produced by chrysarobin when it comes into contact with the eyes. The areas may be covered with zinc oxide adhesive plaster or with collodion.

6. The preparation given in prescription 14.

**PRESCRIPTION 14.—For ringworm of the scalp**

R Ammoniated mercury .. 5 to 10 per cent  
Salicylic acid .. 3 to 5 per cent  
Benzoinated lard, q. s. ..

Irritants such as croton oil, oil of clove and oil of turpentine are used in the superficial variety in an attempt to induce suppuration, thereby converting the superficial into the kerion type. The use of these remedies is not recommended, since they will often produce pronounced scarring. This is not justifiable in a condition that can be treated by other, more satisfactory means.

The principles governing the treatment of tinea barbae are essentially the same as those of tinea of the scalp. Tinea of the bearded region in this country is usually of animal origin and the eruption is of the acute suppurative nodular variety, with boggy swellings and draining sinuses. The infection often goes on to spontaneous cure in a period of about six to twelve weeks. These cases require nothing more than mild antiseptic remedies such as wet dressings of 1 : 5,000 mercury bichloride and removal of the loose, diseased hairs, followed by the application of an ointment containing 5 per cent ammoniated mercury (U. S. P. ointment mixed with equal parts of petrolatum). The less inflammatory, non-suppurating type requires more strenuous treatment with the stronger ointments listed, x-ray epilation, or continuous epilation with forceps.

*Tinea favosa*, or favus, caused by the achorion group of fungi, is a disease that is quite common in Central Europe and is only rarely encountered in this country. It may occur at any age and may attack the scalp, the nails or the glabrous skin. On the skin the eruption is characterized by the pathognomonic sulphur-yellow cups, scutula, which may be isolated and few or in juxtaposition, forming sheets covering large areas. It is easily cured by removal of the cups and by daily paintings with tincture of iodine diluted two or three times with alcohol, or with the milder anti-parasitic ointments.

Besides the form in which one finds the typical yellow cups traversed by hair, lusterless and lifeless in its lower portions, favus is also present on the scalp in a pityriasisform and an impetiginous form. In the former, erythematous patches varying in size and number are distributed throughout the scalp covered with adherent, grayish scales. In the latter, one finds yellowish crusts. Microscopic examination of hair and crusts will establish the diagnosis.

On the scalp the lesions are extremely resistant to treatment and require continued and diligent application of remedies over a long period. The treatment is essentially the same as that of ringworm of the scalp; namely, the use of anti-parasitic remedies and epilation. Good results are achieved with persistent treatment, and progress of the disease may be arrested. Some cases remain obdurate for a lifetime; others go on to spontaneous healing when destruction of the follicles leads to atrophy and permanent alopecia.

*Tinea circinata* is a superficial form common on the glabrous skin of adults and children, which may be caused by various fungi of both human and animal varieties. The lesions are circinate, distinctly outlined spots with clearing centres and with an unbroken erythematous squamous border, which advances peripherally, is frequently vesicular and gives rise to lesions that may reach the size of a palm. A single lesion or

**PRESCRIPTION 15.—For tinea circinata**

R Precipitated sulphur .. .. gr. xlv  
Salicylic acid .. .. gr. xxx  
Petrolatum .. .. ʒii

lesions in large numbers may be present. The exposed surfaces of the body are most often involved. In

children the scalp must be carefully examined and observed for a time after the body lesions have been cured. Treatment consists in painting the lesions daily with a 2 per cent tincture of iodine or daily application of the ointment given in prescription 15. An effort should be made to determine the source, in order to prevent further infection.

*Tinea cruris*, the old *eczema marginatum* of Hebra, is an erythematous, superficial, scaly eruption in the crural region, which extends downward on the inner aspects of the thighs, sometimes extending upward to the pubic region and posteriorly to the buttocks. The eruption is well defined, sharply margined, with a definitely raised border, which is at times vesicular. *Tinea cruris* responds readily to mild anti-parasitic remedies and recurrence takes place only if treatment is discontinued too soon. The most pleasant method of treatment consists in the application of a shake lotion (prescription 16) painted on with a brush,

**PRESCRIPTION 16.—Shake lotion for *tinea cruris***

R Resorcinol .. ..	gr. xc
Calamine .. ..	℥ss
Zinc oxide .. ..	gr. cccc
Glycerine .. ..	℥iii
Lime water .. ..	℥ss
Rose water .. ..	ad ℥iv

morning and night. Cases resistant to this treatment and requiring the addition of 5 per cent precipitated sulphur are rare.

*Tinea versicolor*, caused by *Microsporon furfur*, with its smooth or slightly scaly, fawn-coloured patches of varying size and shape, is found on the chest and back but may also spread to other areas. The eruption causes no symptoms, it is harmless and the individual presents himself for treatment primarily for cosmetic reasons. The eruption is found more often in those who have a tendency to perspire freely and therefore occurs frequently in the tuberculous. Daily baths, using soap freely, followed by vigorous application of a 10 per cent aqueous solution of sodium thiosulphate, will cause the disappearance of the eruption within a week. Infection in the pubic region is often overlooked. It is wise to treat this area in a routine manner in all patients. Treatment must be persisted in for at least several weeks to avoid recurrence. The underclothes must be boiled.

Erythrasma, caused by *Microsporon minutissimum*, affect the same areas as *tinea cruris* and is sometimes confused with it. Not infrequently erythrasma also affects the axillæ. In contradistinction, erythrasma is more brownish red, is not elevated and has no raised vesicular border. The treatment is the same as that of *tinea cruris*.

**MONILIA**

The mycoses caused by yeast-like organisms have a striking resemblance to those caused by the ringworm group. They produce similar clinical pictures and affect the same areas. Mycologic studies are often necessary in order to determine whether one is dealing with ringworm or with yeast infections. Yet these organisms are not immunologically related. Patients with pure monilia infections react strongly to oidiomycin, an extract produced from the monilia group of organisms, while their reaction to triphophytin is negative or, if positive, is based on previous infection with ringworm organisms. Positive passive transfer tests may be elicited by various members of the ringworm group with serum from an individual urticarially hypersensitive to triphophytin, whereas the members of the yeast-like group will give negative results with this serum.

The great folds and clefts of the body are the sites of predilection for infection with monilia and so one finds that the interdigital spaces, the crural and anal regions, the vulva, the areas beneath the breasts in women and the abdominal folds in the obese, are the sites most often involved. The characteristic picture in one of these large folds shows a grayish-white, sodden, macerated band of variable width, usually narrow,

running along the cleft, with an erythematous moist, shiny area extending beyond the grayish border. Outlying satellite, pinhead sized, papular, vesicular and pustular lesions are almost always present.

These infections occur more frequently in diabetic patients and in the obese. It is wise to study all these patients from this point of view and, whenever deemed advisable, to reduce the carbohydrate intake. Wet dressings with a 0.25 per cent silver nitrate solution for twenty-four to forty-eight hours followed by the use of the 4 per cent resorcinol lotion (prescription 16) will often be sufficient to effect a cure. An attempt must be made to keep the parts dry by the liberal use of dusting powder in these areas, and an attempt must also be made to prevent the skin surfaces from coming directly into contact with each other. Interdigital infection with monilia is very common. The clinical appearance and the treatment is the same as that of interdigital ringworm.

Erosio interdigitalis blastomycetica occurs chiefly in those keeping their hands immersed in water a great deal and therefore in housewives and persons employed in occupations such as canning and 'soda jerking'. The eruption is almost always located in the web between the middle and ring fingers, extending on the sides of the fingers for a variable distance, is shiny, moist, erythematous and at times covered with a central, grayish, sodden epidermis. Prophylaxis is the first principle of treatment. The hands must be protected against the effects of moisture by the use of rubber gloves or by abstaining from those processes requiring immersion of the hands. The eruption can readily be cured by painting a 5 per cent solution of silver nitrate on the affected parts morning and night, or by the daily application of a 2 per cent tincture of iodine solution. Sulphur ointment, U. S. P., or ammoniated mercury ointment, U. S. P., are equally efficacious. These ointments should first be used in half strength, i.e., by mixing with equal parts of petrolatum or some other ointment base, and then, if necessary, used full strength.

Not infrequently changes in the nails and paronychia accompany the interdigital infection. The nails become lustreless, opaque and thickened, with transverse or longitudinal ridges. The eponychium becomes erythematous and cedematous. These patients cannot be cured unless they abstain from the use of water on the skin. Locally, superficial, unfiltered fractional doses of x-rays

**PRESCRIPTION 17.—Ointment for *perlèche***

R Ammoniated mercury .. ..	gr. xlv
Salicylic acid .. ..	gr. lxxx
Wool fat .. ..	gr. xc
Petrolatum .. ..	ad ℥iii

combined with the use of half strength sulphur ointment, U. S. P., or half strength ammoniated mercury ointment, U. S. P., give the best results.

Erosio interdigitalis blastomycetica, paronychia and *perlèche* are so frequently associated as to be considered a triad. It must not be accepted that all cases of *perlèche* are due to monilia infection, since cultural examination may show only streptococci and staphylococci. *Perlèche* manifests itself by fissures at the corners of the mouth, at times covered with a whitish pellicle on an erythematous base. In severe cases of long standing, the mucous membrane of the cheek becomes involved. Pain may or may not be present, depending on the depth and extent of the fissuring. Treatment consists in the daily application of a 2 per cent aqueous solution of silver nitrate, a 1 per cent aqueous solution of copper sulphate or of the ointment given in prescription 17.

The use of wet dressings or the continuous water bath may give rise to a very superficial, vesicular and

**PRESCRIPTION 18.—Dusting powder**

R Sodium borate .. ..	..
Boric acid .. ..	..
Zinc oxide .. ..	aa gr. cxx
Talcum .. ..	ad ℥iii



PRESCRIPTION 19.—*Resorcinol lotion*

R Resorcinol .. ..	gr. xl
Zinc oxide .. ..	..
Talcum .. ..	aa ʒi
Glycerine .. ..	ʒiii
Lime water .. ..	ʒss
Rose water .. ..	ad ʒiv

pustular eruption, often covering large body areas. This is referred to as bath mycosis. Treatment necessitates the discontinuance of the water bath or the wet dressing and the application of dusting powder, such as the one given in prescription 18, or painting liberally three times daily until cured with the lotion given in prescription 19.

## ANIMAL PARASITES

The treatment of animal parasitic diseases offers a problem much less difficult. Here one is dealing with animal life on the skin surface or in the horny layer of the epidermis or on the underwear. In rare instances the parasite is to be found below the epidermis. The parasite either is accessible or can be made more accessible by solvents of the horny layer and it is readily destroyed by even small concentrations of the parasitocides. The primary consideration should therefore be to do no harm, since the remedies employed are, in high concentrations, irritants, and also since the number of people who have a heightened susceptibility to these remedies is not inconsiderable.

As a group, the animal parasites account for from 8 to 10 per cent of patients encountered in clinic practice. The percentage in private practice is much smaller, since this group of diseases occurs more commonly in the poorer classes, in people who are more subjected to crowding and people whose personal hygiene is both poor and apt to be neglected. There are only two diseases in this group which are of significance because of their frequency, namely, pediculosis and scabies.

## PEDICULOSIS

Three kinds of lice are parasitic to man: the head louse, the body louse and the pubic louse.

Head lice, causing pediculosis capitis, are found in childhood but at times also affect the adult. The lice cause severe itching and scratching, which may give rise to secondary excoriations, impetiginized lesions, folliculitis and even abscess of the scalp. Secondary infection may be accompanied by swelling of the glands of the neck. A large number of ova, attached by a chitinous membrane to the hair, is distributed throughout the scalp. The diagnosis is simple indeed.

The ease with which the parasite can be destroyed is borne out by the method of treatment used at the Saint Louis Hospital in Paris in the severe cases in which the head teems with pediculi, namely, the application of a thick layer of petrolatum over the entire scalp, which is then bandaged overnight. The parasites are destroyed by suffocation. Pediculi may be destroyed by the application of an aqueous solution of mercury bichloride 1 : 5,000, a 2 per cent betanaphthol ointment, a 5 per cent sulphur ointment or a 10 per cent salicylic acid ointment. The last-mentioned possesses the added advantage of loosening the ova (nits) and softening the crusts so often found in lousiness of the scalp. The nits are best removed with a fine comb dipped in hot vinegar, which dissolves the chitinous membrane attaching the nit to the hair. The danger accompanying the use of the easily ignitable crude petroleum cap, which enjoys a certain modicum of popularity, should be sufficient to cast this form of treatment into the limbo of discarded procedures.

Body lice, causing pediculosis corporis, inhabit the clothing coming into contact with the skin and are characteristically found in the seams of the under-clothing. Sterilization of the clothes and personal cleanliness will suffice to effect a cure.

Pubic lice, causing pediculosis pubis, are not confined to the pubic region but will be found also on the thighs and in the perianal region, buttocks, axillæ, eyebrows, eyelids and beard. They will not live in the scalp.

Mercurial ointment, almost a classic form of treatment, is mentioned only to be condemned. The use of an ointment of such strength for the destruction of pediculi is unwarranted. The dermatitis and also the stomatitis to which it may give rise, even after a single application, is more serious and more annoying than is the pediculosis. Such strenuous measures are unnecessary. An ointment such as the one given in prescription 20,

PRESCRIPTION 20.—*Ointment for pediculosis pubis*

R Precipitated sulphur .. ..	gr. xlv
Betanaphthol .. ..	gr. xxx
Wool fat .. ..	gr. xc
Petrolatum .. ..	ad ʒii

or the U. S. P. ammoniated mercury ointment in one-half strength, is efficacious without the disadvantages obtaining from the use of the strong or mild mercurial ointment. Also to be recommended are prescriptions

PRESCRIPTION 21.—*Peruvian balsam*

R Peruvian balsam .. ..	aa ʒi
Alcohol 60 per cent .. ..	..

Sig.: To be rubbed gently into affected parts morning and night.

PRESCRIPTION 22.—*Mercury bichloride solution*

R Mercury bichloride .. ..	0.5 per cent
Glycerine .. ..	q.s.

21 and 22. The mercury bichloride solution is applied for three or four nights in succession and then less frequently, every three to seven days, for from two to three weeks.

The ova are removed with xylene or with hot vinegar, as mentioned under pediculosis capitis. A cure in this condition is not to be expected in less than a week; in those with a profuse growth of hair on the abdomen and chest, cure may be delayed two weeks or even longer. Daily and diligent application of remedies is essential. Shaving of the affected parts will hasten the cure, but the discomfort attendant on shaving the affected areas may be obviated by the conscientious application of the remedies.

Scabies is a contagious dermatosis caused by an acarus. *Sarcoptes scabiei*, in which the female of the species burrows into the skin, within the horny layer, usually at some favoured site, depositing ova and excrement along this tunnel. The ova hatch in four to six days and are ready to repeat the cycle. The male of the acarus family lives on the skin surface and is easily disposed of.

The eruption is symmetrical and has a characteristic distribution affecting primarily the webs of the fingers, the flexor surfaces of the wrists, the elbows, the anterior axillary fold, the ankles and the buttocks; in women, the breasts and nipples; in men, the penis, and in children the palms and soles. Needless to say, the lesions may appear in other areas but the eruption is characteristically absent above the clavicular level. In the unhygienic the eruption is apt to be characteristic, severe, with numerous vesicles, with secondary scabietic eczema due to scratching and with secondary infected lesions. In the cleanly it may be so mild as to offer difficulty in diagnosis. However, the contagious character of the eruption, the nocturnal pruritus, and finally the demonstration of the acarus help in establishing the diagnosis even in these questionable cases.

Destruction of the parasites and ova will cure the itch. Sulphur is the time-honoured remedy and the remedy of choice. The parasitocidal action of sulphur is, in all probability, due to the formation of hydrogen sulphide on the skin, which, even in low concentration, is fatal to animal life. The patient is instructed to take a warm bath and to wash thoroughly with soap and water for at least one-half hour. Sulphur ointment, U. S. P., one-half strength, is then massaged gently over the body below the clavicular level. Application of the salve, without bathing, is repeated on the two succeeding nights, and on the fourth night the patient is instructed to bathe again. During this course of



treatment the same bed linen and underclothing are used. At the end of the course the linen and clothing are both changed. Sterilization of the underclothing and bed linen is essential. Recurrence is to be attributed to reinfection, in which both improper care of the clothing and the original source of contact play no small part. For obvious reasons, all members of a family who are infected are to be treated at the same time. The patient is to be observed again after a period of several days, and if he is not symptom free and if the physician is convinced that the pruritus is not due to irritation from sulphur, and also that the scratching is not due to habit alone, he is to undergo another course of treatment. Two courses of treatment properly carried out should be sufficient to cure scabies.

In the more severe type of case seen in clinic practice, stronger ointments are used. The addition of soaps

**PRESCRIPTION 23.—Compound ointment of sulphur, N. F.**

℞ Precipitated calcium carbonate	..	gr. clx
Sublimed sulphur	..	..
Juniper tar	..	aa ʒss
Soft soap	..	..
Solid petroxaline	..	aa ʒi

**PRESCRIPTION 24.—Alkaline ointment of sulphur, N. F.**

℞ Flowers of sulphur	..	gr. ccc
Potassium carbonate	..	gr. cl
Ointment base	..	ad ʒiii

and alkalies, such as potassium carbonate, makes for better penetrating power into the burrow. The best known of these are prescriptions 23 and 24.

Another convenient and effective method used in the treatment of scabies in children is the one advocated by Sherwell. Before retiring, the child's body is gently rubbed with flowers of sulphur and then the child is permitted to sleep in a bed that has been sprinkled with the flowers of sulphur. The duration of treatment is one week. Dermatitis from this form of treatment is rare.

There are many other remedies used in the treatment of scabies, but these will be mentioned only briefly. Peruvian balsam from 5 to 15 per cent in ointment form or mixed with equal parts of alcohol is useful. Styra, another balsamic, may also be used in ointment form or as in prescription 25.

**PRESCRIPTION 25.—Styrax ointment**

℞ Styra	..	..	ʒiss
Alcohol	..	..	..
Linseed oil	..	..	aa ʒvi

Betanaphthol may be substituted for sulphur in any of the foregoing ointments in 2 to 5 per cent concentration, but it is apt to produce the same toxic effects that are caused by phenol when used over large areas.

## Reviews

### THE MEDICAL ANNUAL: A YEAR-BOOK OF TREATMENT AND PRACTITIONER'S INDEX.—

Edited by H. L. Tidy, M.A., M.D. (Oxon.), F.R.C.P., and A. R. Short, M.D., B.S., B.Sc., F.R.C.S. Fifty-fifth Year. 1937. John Wright and Sons Limited, Bristol. Pp. lxxi plus 704. Illustrated. Price, 20s.

ANOTHER year has passed and another volume of the *Medical Annual* has been placed on our bookshelves. It has not been a very eventful year and no dramatic discoveries in medical science have been made, but in nearly all branches there have been definite advances which are worthy of record and which have been duly recorded in the *Medical Annual* for 1937. However bored he may be with his profession, however conservative and sceptical of recent advances, or however much he may pride himself on being completely up to date in his study of medical literature, whether he be physician, surgeon or sanitarian, it is seldom that a medical man can resist the temptation of picking up this book from one's table and remarking—'Hello, this year's *Medical Annual*! Do you mind if I just look at it'. Then, one has to be very firm, almost to the point of being offensive, or it will disappear.

For many years the tropical diseases have been very ably reviewed by Sir Leonard Rogers. His place has now been taken by Dr. Manson-Bahr: the name will inspire confidence which the reader will find has not been betrayed. In the malaria section the Ceylon epidemic still looms very large and in the paragraphs devoted to treatment atebirin and its comparison with quinine corners all the attention. The Malay workers seem to consider atebirin musonate by injection the treatment of choice under certain conditions. In the typhus section Sir John Megaw's classification is quoted. Sir John left the Calcutta School nearly ten years ago and had taught this classification for many years before that. It is still the best classification but it seems a little late to quote it in a year book.

Anæmia and blood diseases are treated under separate headings; one wonders why this curious divorce is maintained, as more than half the section on blood diseases is devoted to anæmia. There have been no very important contributions during the last year. Anahæmin and an even more refined and concentrated

extract have been tried in pernicious anæmia with considerable success; of the latter a dose as small as 18 mgm. is effective.

As one would expect the section on dietetics is a rapidly expanding one. This year, useful though this section is, it is a little disappointing. More reference to the League of Nations' work on the standardization of vitamins might have been made, and, in view of the enormous amount of work that is being done on this subject, a small piece of work on clear soups seems to have received undue attention.

One wonders whether plate XLVI, the treatment of surgical shock—by masterly inactivity on the part of the surgeon and his five assistants—was quite necessary. The technique of doing nothing at all could almost be achieved from the written word without visual aid.

A new departure this year is the inclusion of a 29-page general index. The reviewer has felt the want of this in previous years; in his opinion it will add considerably to the utility of this publication, which this year has in every way maintained its own very high standard.

L. E. N.

### THE EXTRA PHARMACOPŒIA—MARTINDALE.

Twenty-first Edition in Two Volumes. Volume I. Published by direction of the Council of the Pharmaceutical Society of Great Britain. 1936. The Pharmaceutical Press, London (23, Bloomsbury Square, W.C.1). Pp. xxxiv plus 1182. Price, 27s. 6d.

MARTINDALE AND WESTCOTT'S *Extra Pharmacopœia* made its first appearance fifty-four years ago; it was a small volume of just over three hundred pages. That it was an immediate success is obvious from the fact that the following year two more editions were published and the year after that yet another; since then editions have appeared at about three-year intervals. The scope of the book does not appear to have been widened, but pharmacological research and commercial enterprise caused such a rapid extension of the field covered by the book that twenty-five years later, in its thirteenth edition, it had reached the generally-accepted limits of a single volume, about twelve hundred pages, and all subsequent editions to the fourteenth

have been published in two volumes. The second volume deals with the analysis and assay of pharmaceutical products, medical diagnosis, and other related matter which does not fall under the various headings of the pharmacopœia proper.

Two generations of Martindales were responsible for the book during the first fifty years of its life, and for forty-two of these either father or son was assisted by Dr. Westcott, but the nineteenth and twentieth editions were published under the editorship of William Harrison Martindale alone. When he died in 1933 the responsibility for the publication of further editions was undertaken by the Pharmaceutical Society of Great Britain.

It is very seldom that a medical book reaches the distinction of being considered a masterpiece that must be acquired for the nation—for practical purposes this is what has been the fate of the *Extra Pharmacopœia*. We have only one small regret—two generations of medical men and pharmacists have known this book as 'Martindale and Westcott'; it was perhaps reasonable enough to drop the 'Westcott' when Dr. Westcott died and Martindale alone became responsible for its publication, but now that the latter has also passed the necessity for brevity seems to be the only excuse for not reverting to the older title.

It is five years since the last edition of volume I appeared; the length of this interval is obviously not because there has been little to add but, on the contrary, because there has been so much, and it has, therefore, been necessary to revise every section very thoroughly in order to weed out the obsolete and superfluous matter. There has been considerable rearrangement and many of the classifications of the older editions have been abandoned. Such comprehensive headings as 'animal organotherapy' have given way to more specific ones, 'œstrin', 'pituitary', 'thyroid' and 'insulin'; under the last-named heading we notice that both protamine insulinate and protamine-zinc-insulin are included, and references given to papers that appeared late in 1936.

Few older practitioners will be unfamiliar with this book, but, as it is, in our opinion, a very important one, we will give a brief description of some of the sections, selected at random:—

*Acidum mandelicum*.—The treatment of urinary infections with preparations of the acid and its salts.

*Sodii thiosulphas*.—The prevention and treatment of stomatitis due to injections of mercury, bismuth, or arsenic.

*Acidum tannicum*.—Its application and value for the treatment of burns.

*Barbitonum*.—The composition and characters of all the important members of the wide field of barbiturates.

*Digitalis*.—The glycosides and standardized preparations available for the treatment of heart diseases.

*Histaminæ phosphas acidus*.—The new official salt used in the treatment of rheumatism.

*Histidine hydrochloride*.—Opinions and experiences concerning its action in the treatment of peptic ulcers.

*œstrinum*.—Under this heading the male and female hormones are described, and the numerous proprietary products which depend for their action upon these bodies are summarized.

*Oleum hydnocarpæ*.—The varieties and derivatives used in the treatment of leprosy are described.

*Oleum morrhue*.—Calciferol, halibut-liver oil, and vitamin-A and -D preparations generally are summarized in this section.

Some will be sorry to see that the well-known publishers, H. K. Lewis and Company, are no longer responsible for the book, but we suppose that it was natural that a change should be made with the change of editorship; the late publishers will be flattered to see that there is little change from the old format.

The number of books that are described as 'essential for every practitioner' is alarmingly large, but this really is a book that once they have acquired the habit of using it there are few practitioners who will be prepared to face their work without it.

L. E. N.

## THE MANAGEMENT OF OBSTETRIC DIFFICULTIES.

—By Paul Titus, M.D. 1937. C. V. Mosby Company, St. Louis. Pp. xxii plus 879, with 314 illustrations including 4 coloured plates. Price, \$8.50.

THIS book is intended for the obstetric specialist and also to help the general practitioner in dealing with emergencies in obstetric practice. The author presents his personal opinions and preferences which are however representative of the teaching of the more conservative school of American obstetricians. There are numerous references, mainly to American and German authorities and particularly to Dr. Whitridge Williams to whose influence the author makes acknowledgment.

The book is wide in its scope. The first section deals with the problems of conception and the treatment of sterility. This is followed by a section on the diagnosis of pregnancy and its complications. Surgical emergencies and systematic diseases in pregnancy are given a well-deserved place, and are treated at greater length than in many textbooks of obstetrics. The main part of the book is devoted to the complications of labour and the puerperium. Operative technique is described in detail and the illustrations are excellent. Puerperal sepsis and the complications of the puerperium are treated briefly and reference is omitted to the later work on the ætiology and treatment of septic puerperal infections.

The teaching differs little in the main from that of the British schools. An exception to this is the prejudice in favour of packing the uterus which the writer recommends not only in the treatment of post-partum hæmorrhage but as a prophylaxis against hæmorrhage to be carried out in the course of Cæsarean section.

This book is a valuable addition to the obstetrician's library and provides a corollary to Dr. Whitridge Williams' well-known textbook of obstetrics.

M. N.

## VADE MECUM OF MEDICAL TREATMENT.—By

W. Gordon Sears, M.D. (Lond.), M.R.C.P. (Lond.). 1937. Edward Arnold and Company, London. Pp. vii plus 368. Price, 10s. 6d.

THIS book provides in a convenient form and handy size an account of the treatment for all the diseases commonly encountered in general practice. The conditions dealt with are arranged alphabetically to facilitate ready reference, although in a few instances the diseases of one organ, e.g., the heart, have been advantageously grouped together.

The volume does not cover the whole field of medicine nor go deeply into any particular branch of it, but it provides an excellent synopsis of medical treatment with indications for surgical, spa, or other specialized methods outside the practitioner's scope. Occasional reference has been made to methods and points of diagnosis, as in agranulocytosis, bronchiectasis, conia, Hodgkin's disease, etc. Incubation, isolation and quarantine periods as well as the prophylactic methods have been stated in connection with the infectious diseases.

The treatment given is based on the author's personal experience and information taken from recent literature, and is systematic and comprehensive. Wherever possible, many alternative preparations and prescriptions have been supplied.

Various modern lines of treatment have been referred to, viz, massive doses of iron for microcytic anemia, mandelic acid for urinary infection, gonadotropic hormone in undescended testes, snake venom in hæmophilia, etc. The use of various new preparations, viz, anahæmin, ascorbic acid, etc., has been mentioned. Histidine treatment of peptic ulcers has been recommended, but the author rightly states that the scientific basis of this method has yet to be proved.

Useful tables have been given at the end of the book.

In the preface, the author has asked for suggestions whereby the utility of the book may be increased. The following may be said:

While rare conditions, such as botulism and polycythæmia, have been dealt with, important tropical conditions, such as kala-azar, sprue and beri-beri, should be included. A long course of quinine for over a period of three months has been recommended for routine treatment of malaria, but the modern teaching is in favour of the short course (7 to 10 days) to be repeated in the case of relapse only. Similarly atabrin is hardly used for 7 to 10 days and repeated after a week's rest. Only an outline of the treatment of phthisis has been given, but some more details would be welcome. Use of carbarsone should be mentioned in the treatment of amœbic dysentery and of dmelcos in soft sore.

R. C.

**PRACTICAL METHODS IN THE DIAGNOSIS AND TREATMENT OF VENEREAL DISEASES FOR MEDICAL PRACTITIONERS AND STUDENTS.**—By D. Lees, D.S.O., M.A., M.B., D.P.H., F.R.C.S. (Edin.), F.R.C.P. (Edin.), F.R.S.E. Third Edition. 1937. Edited and Revised by R. Lees, M.B., F.R.C.P. (Edin.). E. and S. Livingstone, Edinburgh. Pp. xvi plus 608. Illustrated. Obtainable from Messrs. Butterworth and Company (India), Limited, Calcutta. Price, Rs. 10

BEARING in mind the numbers of books on venereal diseases which have made their appearance during the last few years, it is a great tribute to the popularity of David Lees' book that it has so rapidly reached its third edition.

A short while ago we mourned the loss of Dr. David Lees. The third edition of his book is posthumous, and is a tribute to his memory. It is edited by his kinsman, Dr. Robert Lees, who has revised some of the chapters in collaboration with three other contributors, namely, Drs. Cranston Low, William Logan and R. C. Batchelor.

The volume has been revised, and new and up-to-date matter has been added in many places, especially in the chapters on syphilis of the nervous and cardiovascular systems and on vulvo-vaginitis in children. This has been accomplished without adding to the length of the book, for it contains some 30 pages less than the second edition. But it maintains the same high degree of excellent teaching as the former editions. There is practically no difference in the arrangement of the chapters which follow in the same sequence.

The illustrations are few in number and we suggest that in future editions these be increased. There is an excellent description of the appearances seen both in the normal and diseased urethra, but the value of this would be enhanced if it were accompanied by a coloured plate depicting the conditions described. The editors continue to advocate the prolonged method of the treatment of syphilis, for no mention is made of the speeding up which is in vogue in some of the other schools.

This work will continue to hold its place in the forefront of the literature on venereal diseases.

H. E. M.

**DISEASES OF THE TESTICLE.**—By Hamilton Bailey, F.R.C.S. (Eng.). 1936. H. K. Lewis and Company, Limited, London. Pp. v plus 166, with 129 illustrations, of which 10 are coloured. Price, 12s. 6d.

THIS is a really excellent little book, in which all the diseases of the testicle are dealt with. It is true that many of them are barely mentioned, but in a book of this size that is all that can be expected. The author explains the various theories to account for descent of the testes, and operations are described for placing and retaining the undescended testicle in the scrotum.

The idea prevalent amongst some surgeons, that scrotal incisions should not be made as they do not heal well, is refuted, and if Mr. Bailey's technique is

carried out there is no reason why scrotal incisions should not heal by first intention just as well as incisions in any other part of the body.

On page 99 it is stated that it is doubtful if there is any such condition as traumatic orchitis. In this we beg to differ and feel convinced that traumatic orchitis as a separate entity, though rare, does exist. This little volume is well worth its price, and can be confidently recommended as useful to all medical men.

H. E. M.

**PHYSICAL DIAGNOSIS.**—By Ralph H. Major, M.D. 1937. W. B. Saunders Company, Philadelphia and London. Pp. 457 with 427 illustrations. Price, 21s.

THIS book is intended as a textbook of physical diagnosis. The author was a worker under Friedrich V. Müller of Munich, to whom he pays due respect and dedicates the book. He has tried to emphasize, as Skoda did a century ago, that physical signs are produced by physical causes, and that these physical causes must be understood before the physical signs can be properly appreciated. He has drawn freely both in subject-matter and in illustrations from many sources. It is of interest to see the original descriptions of Biot's respiration, Traube's semilunar space, Skoda's resonance, etc. Similarly, Traube's curve of pulsus alternans is of more interest than many others of this kind which have been made since.

Physical diagnosis refers to the results obtained from direct examination of the patient by the usual methods of inspection, palpation, percussion and auscultation which have been described with accuracy. The physical findings in various diseases of the lungs and in cardiovascular diseases have been separately dealt with. These are followed by a résumé of the examinations of the abdomen, extremities and the nervous system. In the last chapter the points of history taking and recording have been described.

The book is clearly written, and physical signs and their physiological basis are described in detail, especially in connection with the lungs and heart, while mere outlines have been given for the examination of the nervous system. Brief references have been made to electrocardiograms and roentgenology, but electrical reactions, examination of urine, fæces, etc., have not been included. A special chapter has been written on 'pain', one of the most common complaints that call the physician to the patient, but pain referable to gastric disorders has been left out.

The book is, on the whole, well got up and is profusely illustrated. Students and practitioners will find it very useful and practical. A bibliography has been given at the end of each section.

R. C.

**AIDS TO DIAGNOSIS AND TREATMENT OF DISEASES OF CHILDREN.**—By F. M. B. Allen, M.D., M.R.C.P. (Lond.). Seventh Edition. 1937. Baillière, Tindall and Cox, London. Pp. vii plus 329. Price, 4s. 6d.

WHILE numerous books on diseases of children have lately been published, the appearance of the seventh edition of this volume of the 'Aids' series shows that a definite field of usefulness for it still persists.

Dr. Allen has rewritten and rearranged the material of previous volumes in the light of modern research work and investigation. Particular attention has been paid to the section on infant hygiene and feeding and those conditions peculiar to childhood. Diseases such as asthma and pink disease have been included for the first time.

Recent views on treatment of various disorders are well summarized. Nirvanol and calcium aspirin in chorea, mandelic acid in pyelitis and ascorbic acid in scurvy have been referred to, but not 'glycine' in muscular dystrophy. Chapter X on the specific fevers deals with ten infectious diseases only. Diseases such as dysentery and cholera have not been dealt with. Nothing has been said about the anæmias in infancy and childhood except the von Jaksch's type.

There is a useful appendix with notes on 'food preparations', antipyretic methods, diagnostic tests, etc., followed by a collection of 64 prescriptions reproduced from the Belfast Hospitals Pharmacopœia. For a student who wishes to revise the subject rapidly or a busy practitioner who wishes to refresh his memory, this volume has certain advantages.

R. C.

**RECENT ADVANCES IN RADIOLOGY.**—By P. Kerley, M.D., B.Ch. (N.U.I.), D.M.R.E. (Camb.). Second Edition. 1936. J. and A. Churchill, Limited, London. Pp. x plus 322, with 176 illustrations. Price, 15s.

RADIOLOGY is a rapidly-advancing subject; not only does each year see a considerable improvement in the technique of the radiological methods already established, but the scope of this science is continually widening and visualization of more and more of the soft tissues of the bodies is ever becoming practicable.

It is most essential that the practitioner should be able to interpret skiagrams himself, as he is in a far better position than the radiologist to attach the proper significance to what he sees, and when occasion arises, as it often does, to decide whether the clinical or the radiological evidence is to carry greater weight.

This book is much more than a record of recent advances; it gives a very accurate and reasonably complete cross section of our present knowledge on the subject. Only technique as far as it applies to the preparation, etc., of the patient is described and there is no description of apparatus, but the book may be looked upon as a complete textbook on the subject as far as the practitioner is concerned.

The section on pulmonary tuberculosis is clarified by a very simple classification of the salient radiological and pathological lesions in infantile, adolescent and adult tuberculosis. There are some excellent skiagrams and a few line drawings illustrating the different types of lesion.

The section on the alimentary tract is equally good. The author takes the view that non-visualization of the appendix is evidence of disease, but he lays emphasis on the importance of giving a special 'appendix meal', an ordinary barium meal followed three hours later by a dose of salts, which, he says, will visualize the appendix in 100 per cent of cases. He gives a list of observations which he considers indicate a pathological appendix. This is fairly comprehensive but does not include the presence of faecaliths in the appendix; these he says so often disappear within a few hours.

In order to keep this book within reasonable proportions the author has had to exclude any reference to x-ray therapy; the reviewer was a little disappointed at this omission but he appreciates the reason for this decision and hopes that the opportunity thus given of adding another volume to this excellent series will soon be taken.

The book is a very valuable contribution to the subject and well up to the high standard of this excellent series.

**UROLOGICAL ROENTGENOLOGY: A MANUAL FOR STUDENTS AND PRACTITIONERS.**—By M. B. Wesson, M.D., and H. E. Ruggles, M.D. 1937. Henry Kimpton, London. Pp. 269. Illustrated with 227 engravings. Price, 22s. 6d.

THIS little volume contains in small compass the clearest and most complete exposition of the difficult subject of the interpretation of urological skiagrams which I have so far read. It has been specially prepared 'to meet the needs of the physician who wants to interpret urograms, be he urologist, roentgenologist, general practitioner or interne'.

The arrangement of the chapters leaves nothing to be desired. They include in order: Technique of urography, Normal renal pelvis and ureter, Abnormal position of kidney, Congenital anomalies of the kidney and ureter, Hydronephrosis, Urogenital infections,

Urinary lithiasis, Renal tumour, Traumatism of the urinary tract, Neurological lesions involving the urinary tract, Cystography, urethrography, urethrocystography and vesiculography, Chyluria, Aneurysm of the renal artery, Post-operative deformity, Nephrobronchial fistula, Metastasis from cancer of the prostate. This list is sufficiently comprehensive for most purposes.

The book is illustrated by over two hundred excellent reproductions of skiagrams, which have taken years to collect and some of which are sufficiently rare to be of classical significance.

Both the authors are well-known writers, so that anything emanating from their pens may be considered authoritative.

The paper, printing, illustrations and general presentation of this book is worthy of such well-known publishers.

No attempt has been made to give a complete list of authorities; but the references given are fairly comprehensive.

We can recommend it to general practitioners, urologists and roentgenologists, whether specialists or not, as well worth perusal and preservation as a work of reference.

J. A. S.

**THE MORPHINE HABIT AND ITS PAINLESS TREATMENT.**—By G. Laughton-Scott, M.R.C.S., B.A. (Oxon.). Second Edition. 1937. H. K. Lewis and Company, Limited, London. Pp. vii plus 105. Price, 5s.

THIS excellently-printed little book is a condensed statement of well-known facts regarding morphine addiction and its treatment. Laughton-Scott is a well-known authority on drug addiction and the work is based upon his personal observations. The lines of treatment stressed by the author are entirely new and should be given a trial. Unlike Lambert, the author does not push the use of belladonna to a toxic state attended with delirium and confusion when the drug is suddenly withdrawn. By gradually increasing the dose of belladonna and at the same time by reducing the dose of morphine ultimately substitutes the vagotonic effects of belladonna for that of opium when the craving disappears. It is claimed that in this way the mental faculties of the patient are not disturbed and he is spared the shock of delirium and diarrhoea and insomnia which are quite common with Lambert's treatment. The book also gives a short account of 20 cases treated. The author has made an important and helpful contribution to the treatment of morphine habit, but unfortunately he has not discussed some of the other well-known methods of treatment. The book will be read with great interest by the medical profession in general and by those interested in the problem in particular.

G. S. C.

**PASSIVE VASCULAR EXERCISES AND THE CONSERVATIVE MANAGEMENT OF OBLITERATIVE ARTERIAL DISEASES OF THE EXTREMITIES.**—By L. G. Herrmann, A.B., M.D. 1936. J. B. Lippincott Company, Philadelphia and London. Pp. xx plus 288. Illustrated with 80 engravings and 4 coloured plates. Price, 20s. Obtainable from Messrs. Butterworth and Company (India), Limited (Publishers), Calcutta. Price, Rs. 15.

THE vagueness of nomenclature which strikes one at first sight of the book is gradually removed as the reader goes through the first introductory chapter which explains the author's object in writing this excellent monograph. Simplified into its A.B.C., this appears to be a call to 'the medical uses of such physical agents as the atmospheric pressure in the treatment of diseases, especially circulatory diseases'. It cannot be denied that the scientific knowledge of the influence of atmospheric pressure on certain human diseases, more particularly cardiac disorders, hypertension, etc., is sadly lacking and the physician's advice to such patients often lacks conviction. The bacteriologist has, no

doubt, learnt by experience that the growth of certain micro-organism may be profoundly influenced by altering the tension of the surrounding atmosphere, but it appears that the true rationale of such factors is still wanting in details.

Dr. Herrmann in a painstaking manner has searched for the thoughts and efforts of all the previous investigators upon the subject and has laid down in this volume a commendable and complete summary of the work which has been done, particularly in so far as it relates to the treatment of peripheral vascular diseases. The practical manner in which he has related his actual experiences and the uses of the Pavaex therapy (which is essentially a mechanical means of performing passive exercises of the vascular system) as an adjunct to the treatment of peripheral vascular diseases (such as organic obliterative arterial diseases of the extremities, peripheral senile arterio-sclerosis, trophic lesions of the toes, gangrenous digits of the hands or feet, etc., etc.) will be found to be most useful to those who work on similar lines. It is to be hoped that Dr. Herrmann's work will stimulate further research so that in time some form of Pavaex therapy will be considered essential for every modern hospital treatment.

The book is of great practical value as it seeks to bring to our aid the utilization of the three great natural agents, *viz.* environmental pressure, temperature and moisture, in the treatment of peripheral vascular diseases and we consider it to be a forward step towards the utilization of natural forces in the treatment of disease.

J. P. B.

**A TEXTBOOK OF MENTAL DEFICIENCY (AMENTIA).—**By A. F. Tredgold, M.D., F.R.C.P., F.R.S.E. Sixth Edition. 1937. Baillière, Tindall and Cox, London. Pp. xvi plus 556, with 34 plates. Price, 25s.

As a treatise on amentia Dr. Tredgold's book has become a classic, so it is not a matter for surprise that it has now reached its sixth edition. Indeed there are few contributions on the subject that can in any way compare to it. As the author observes, mental deficiency has become a serious social problem as well as an important branch of psychological medicine. In dealing with the problem of the transmission of mental deficiency, Dr. Tredgold is in agreement with the majority of observers that our knowledge of biology and genetics is at present far too incomplete to enable us to treat of the inheritance and transmission of mental deficiency with any degree of precision. Dr. Tredgold inveighs against the all-too-common belief that genius is so intimately connected with insanity that we must cheerfully put up with the latter for the sake of the former. He maintains that the great majority of men and women of outstanding ability have been particularly sane and have come of sane and healthy stocks. This view does not altogether coincide with that of Havelock Ellis who, in his compendious *Study of British Genius*, states that men of high intellectual ability generally display a lack of muscular co-ordination and usually suffer from extreme shyness, bashfulness or timidity. The whole question is made no easier to understand when we study the chapter devoted to 'Idiot Savants'. Dr. Tredgold cites a case, reported by Dr. L. Lotte of Armentières, of a young man who had developed an extraordinary faculty of calculating. When he was asked how many grains of corn there would be in any one of 64 boxes, with 1 in the first, 2 in the second, 4 in the third, 8 in the fourth, and so on, he gave the answers for the fourteenth (8,192), for the eighteenth (131,072), and the twenty-fourth (8,388,608) instantaneously, and he gave the figures for the forty-eighth box (140,737,488,355,328) in six seconds. He also gave the total in all the 64 boxes correctly (18,446,734,073,709,551,615) in forty-five seconds. In the matter of birth control, Dr. Tredgold observes that while birth control makes practically no appeal to the biologically unfit, that is to the thriftless, the dependent,

and parasitic sections of the community, it makes a strong appeal to the efficient, thrifty and prudent. In such circumstances, Dr. Tredgold concludes, a general advocacy of birth control only tends still further to increase the disproportion between the efficient and inefficient. As regards the concept of a *moral sense*, Dr. Tredgold's view has not undergone much modification since the second edition of this book, published in 1914. Ethical perceptions, ethical judgments and ethical acts are complicated feats of the whole developed mind, processes whose slow evolution we can follow, step by step, in the race, in the nation and in the child. No psychologist to-day could subscribe to so figurative a doctrine of a *moral sense* as conceived by Dr. Tredgold. Rather would he be tempted to contend that if the moral defective is to be defined as a person born without a moral sense, then we must all be moral imbeciles, for none of us is ever born with it. Morality, in short, is something which is acquired afresh by each individual from his own social environment, not a thing which is uniform all the world over and inherited as part of our common human nature.

O. B-H.

**MOVEMENT: A CLUE TO BRAIN ACTION—ONE WAY TO STUDY A CHILD.**—By Helen Coomber, B.Sc. 1937. Faber and Faber Limited, London (24, Russell Square). Pp. 196. Illustrated. Price, 3s. 6d.

In the preface Miss Coomber states that she has written this book to induce young folk in contact with children to observe and describe them in a manner first outlined by the late Dr. Francis Warner, Senior Physician to the London Hospital. Miss Coomber contends that the study of a child's movements and postures reveals the mode of its brain action. There is little doubt that as a general proposition this is largely true but Miss Coomber appears to disregard at least one feature of considerable importance, namely, the 'symbolic' nature of many movements of children, especially of the face and hands. In other words, she overestimates the neurological factors involved at the expense of the psychological. Miss Coomber has some very good advice to offer parents and teachers in respect to the effects of overstimulation or of too little stimulation in the early years of childhood. Perhaps she fails to distinguish the importance of discriminating between the types of thinking to be noted in children with, to employ Jung's classification, a tendency to 'extravert' thinking as opposed to children with a tendency to 'introvert' thinking. Anyhow, the book is entitled to welcome in a country like India where children continue in their homes and schools to run to waste like rapids.

O. B-H.

**ORIGINAL PAPERS OF RICHARD BRIGHT ON RENAL DISEASE.**—Edited by A. Arnold Osman, D.Sc., F.R.C.P. 1937. Oxford University Press, London. Humphrey Milford. Pp. xvi plus 172. Illustrated. Price, 21s. Obtainable from Oxford University Press, Bombay, India

TO-DAY we think of Richard Bright as one of the great clinicians of the early nineteenth century and this he undoubtedly was, but probably in his own day he was looked at askance by some of his more conservative seniors for his insistence on the study of morbid anatomy in conjunction with his clinical observations, just as to-day the older school is liable to deplore the decline of bedside diagnosis and its subservience to the laboratory.

These papers of Richard Bright are a joy to read, not only for the lesson they teach—and the last hundred years have not carried us so very much further in the study of renal disease—but as examples of how to report a case, and for the precise, concise, and polished English in which they are presented.

The perfect illustrations can surely never have been surpassed in any medical work.



Four papers are here reprinted—'Cases Illustrative of some of the Appearances Observable on Examination of Diseases terminating in Dropsical Effusion', 'Cases and Observations Illustrative of Renal Disease accompanied with Secretion of Albuminous Urine', 'Tabular View of the Morbid Appearances in One Hundred Cases connected with Albuminous Urine', both from the Guy's Hospital Reports of 1876, and 'Functions of the Abdomen and some of the Diagnosis Marks of its Disease', a Gulstonian lecture.

Finally, there is a report on the radiological and histological examination of Bright's original specimens.

The book makes an invaluable addition to a physician's library on account of the clinical, pathological and histological significance of the matter presented. The get-up of the book is excellent and the reproduction of the illustrations little short of perfect.

L. E. N.

**STARLING'S PRINCIPLES OF HUMAN PHYSIOLOGY.** Seventh Edition. Edited and Revised by C. L. Evans, D.Sc., F.R.C.P., F.R.S., LL.D. (B'ham). The Chapters on the Central Nervous System and Sense Organs—Revised by H. Hartridge, M.A., M.D., So.D., F.R.S. 1936. J. and A. Churchill Limited, London. Pp. xiii plus 1096, with 554 illustrations, 6 in colour. Price, 24s.

For it to fall to one's lot to undertake the editing of any classical work of high standing is a very great honour and a very grave responsibility, but when the subject of this work is one in which important advances are made almost daily, so that what was true yesterday is only partially true, or quite untrue, to-day, the sense of responsibility must be so heavy as temporarily to dull any other mental reaction. This is the third edition for which the present editor and reviser, Dr. C. Lovatt Evans, has been responsible, and the fact that the book has maintained its high position as a standard textbook of physiology is so very much to his credit that after the strain was over we hope he allowed himself the luxury of a little legitimate pride, before setting to work on the next edition.

The temptation to include new matter without excluding the old in each new edition must be very great and perhaps one of the most remarkable, and certainly from the student's point of view the most important, feature of this edition is that it is shorter than the last by about 20 pages.

Biochemistry is year by year becoming more important in medical science and it is difficult to draw the line where biochemistry ends and physiology begins, and in this book it has been necessary to include some purely biochemical work that has led directly to advances in physiology.

The editor has succeeded in a remarkable way in 'capturing the fleeting pattern' of the kaleidoscope of modern physiology and he has presented it in a way

that the young student can understand it and the post-graduate student apply it to his practice. The publishers have achieved a most remarkable feat in producing a thousand-page book of this quality for such a remarkably low figure.

**HANDBOOK OF HYGIENE FOR STUDENTS AND PRACTITIONERS OF MEDICINE.**—By J. W. Biggor, M.D., So.D., F.R.C.P.I., D.P.H., M.R.I.A. 1937. Baillière, Tindall and Cox, London. Pp. xi plus 405, with 16 figures in the text. Price, 10s. 6d.

Dr. Biggor's *Handbook of Hygiene* is a welcome addition to the textbooks on hygiene for the use of medical students. It contains a great deal of information in a concise form. At the same time it makes an easy reading. This has been accomplished by a very careful selection of the material presented. The most refreshing part of the work is the addition of new chapters on subjects which are not usually dealt with in books of this class. I specially refer to the chapters on poisonous cases and the assessment of normal health. All hygiene books must necessarily emphasize the problems which are of special interest to the country to which they relate. They have to borrow local practices and usages which results in a more or less local rather than universal outlook. The book can be confidently recommended to Indian students as a useful supplement to their Indian textbooks.

R. B. L.

**PHYSIOLOGY AND ANATOMY.**—By E. M. Grolshelmer, B.S. in education, M.A., Ph.D., M.D. Third Edition. 1936. J. B. Lippincott Company, Philadelphia and London. Pp. xvii plus 706. Illustrated. Price, 12s. 6d. Obtainable from Messrs. Butterworth and Company (India), Limited, (Publishers), Calcutta. Price, Rs. 9-6

That the author has found it necessary to produce a third edition of this book is in itself sufficient to prove that it must have a popular stand among such textbooks.

The arrangement is ideal in its concise form of definition, which should prove most helpful to all senior student nurses and to all those nurses desirous of taking a post-graduate course.

The first two chapters deal with an introduction to anatomy and physiology, and each following chapter gives a clear outline of each of the separate systems of the body, both anatomical and physiological.

There are many very clever illustrations which will be greatly appreciated by every nurse who studies from this book.

While the material is rather far advanced for junior nurses, we feel confident that every senior nurse, especially those studying for the final examinations, etc., should have it in their keeping.

E. C.

## Abstracts from Reports

### ANNUAL REPORT OF THE PUBLIC HEALTH COMMISSIONER WITH THE GOVERNMENT OF INDIA FOR THE YEAR 1934

(Continued from last issue, p. 326)

#### TOLL OF DISEASES IN INDIA

Judged by the recorded statistics, imperfect though there are, the year 1934 was a moderately healthy one. The death rate, though in excess of that for 1933, was the second lowest during the past decade.

Of a total of 6,900,000 deaths or 24.9 per mille in British India, nearly 200,000 or 0.7 per mille were from cholera; 84,000 or 0.3 per mille from smallpox;

80,000 or 0.3 per mille from plague; 4,000,000 or 14.4 per mille from fevers; 300,000 or 1.0 per mille from dysentery and diarrhoea; 500,000 or 1.8 per mille from respiratory diseases; and 1½ million or 6.4 per mille from other causes.

As before, the fevers group contributed to the largest number of deaths, that is 58 per cent of the total, 'other causes' following with 26 per cent. The major epidemic diseases—cholera, plague, and smallpox—together accounted for 4 per cent and for a combined death rate of 1.3 per mille. Deaths from 'other causes' include 23,000 from snake-bite or wild beasts, and 13,000 from suicide, of which a little over 6,000 are amongst males and over 7,000 amongst females.



Details of the incidence of some of the main diseases are given below:—

**Cholera.**—The spread of cholera in India is closely associated with pilgrimages which draw large numbers from the rural areas. A comparison between festival and non-festival years in the United Provinces and the Punjab shows that the mean cholera incidence is higher in festival years than in non-festival.

**Anti-cholera measures.**—Routine sanitary measures, such as the improvement and disinfection of water supplies in villages and at fairs, etc., improvement of conservancy, medical inspection at railway stations of pilgrims, the enforcement of temporary regulations under the Epidemic Diseases Act, the employment of epidemic staffs and propaganda, were adopted in various centres as and when necessary. Inoculation with cholera vaccine remains the most effective method of personal prophylaxis. Unfortunately, however, many still prefer to run the risk of infection, otherwise the figures of death from cholera would be far lower than they are. The total anti-cholera inoculations performed during the year were nearly 5½ millions.

**Plague.**—Whilst increased mortality was reported in all provinces except Madras, Central Provinces and Coorg, the death rate for British India as a whole, namely 0.3 per mille, was still well below the decennial mean of 0.5 per mille. The most noteworthy feature of the epidemic was that the disease again remained confined to its important haunts in Northern India which suffered heavily.

**Anti-plague measures.**—Anti-plague inoculations performed in the various provinces totalled nearly 13 lakhs. Rat flea surveys were continued in Madras and various interesting experiments conducted. The figures available show that nearly 800,000 rats were destroyed in Delhi Province, 900,000 in the United Provinces, 600,000 in the Central Provinces, 800,000 in Burma, while nearly 200,000 rat holes in 25 different localities in Madras, comprising 15½ thousand houses, were fumigated.

**Smallpox.**—Smallpox was moderately prevalent this year. Governments or local authorities maintain adequate staffs of vaccinators throughout the country, and vaccination and re-vaccination are free. The disease, however, still remains endemic and is responsible for 1.2 per cent of all deaths, its continued prevalence being apparently a measure of the passive resistance to public health improvement.

The mean death rate per mille was 0.3. The rural death rate was 0.3 per mille and the urban 0.4 per mille. Of the total number of deaths, 46 per cent were of children, 19 per cent being of those under 1 year and 27 per cent being of those between 1 and 10 years. These figures are an indication of the deficiencies in infant and child vaccination throughout the provinces.

The number of vaccinations performed has increased by over 1½ million to a total of 23½ millions. This increase is spread over both primary vaccinations and re-vaccinations, the number of operations having increased by 200,000 and a little less than 1 million respectively. Increases in the number of operations performed were recorded in most of the provinces, particularly in Madras and Bombay Presidencies.

Out of 9½ million registered infants, only 44 per cent were successfully protected. Until this exceedingly low percentage is at least doubled, there can be little hope of preventing epidemic smallpox in the country. Glycerinated lymph, manufactured at provincial vaccine institutes, continued to be used. Nearly 33 million doses of vaccine were produced during the year, and 31 million issued.

**Fevers.**—Fevvers constitute a heterogenous group, in which little detailed information can be obtained.

**Malaria.**—Apart from deaths in hospitals and dispensaries, information as to mortality from malaria is scanty and unreliable. The general belief that approximately one-third of all deaths recorded as due to fevers is in fact due to malaria does not appear to be an over-statement of the position.

The total estimated deaths from malaria during the year were 1,300,000. This figure, however, excludes the

mortality caused by malaria indirectly. This mortality is believed to be fairly high, for the debilitating effects of malaria are partly responsible for the large number of deaths recorded as due to influenza, pneumonia, dysentery, etc.

Lieutenant-Colonel Sinton, Director of the Malaria Survey of India, summarizes the position in regard to mortality from malaria in the following conclusions:—

(1) In ordinary years, malaria is responsible directly for at least 1,000,000 deaths each year, and, in years when severe regional epidemics occur, this figure may be increased by another quarter to half a million. The fatal effects of the disease fall chiefly on children and infants. The local distribution of the mortality may be markedly increased by conditions of economic stress.

(2) Apart from direct mortality due to malaria, it has also a marked indirect action by lowering the general vitality of its victims, whereby many of them become more liable to contract other diseases, from the effects of which many of them die at a later date.

(3) There seems little doubt that malaria, by its combined direct and indirect actions, is responsible for at least 2,000,000 deaths each year in India.

There is some reason to believe that not more than one-tenth of the persons suffering from malaria in India actually receives treatment in hospitals and dispensaries. If this be so, then the total cases of malaria must have been over 110 millions in 1934. The Director of the Malaria Survey of India considers 'there is very considerable evidence to show that, at least, 100,000,000 individuals suffer yearly from malaria in British India alone, and that this is probably a moderate estimate. In addition to these, there is an indirect morbidity predisposed to by this disease which may be between 25 and 75 million cases'.

Major-General Sir John Megaw, late Director-General, Indian Medical Service, on the basis of an enquiry made by him in 1933 from medical officers stated 'the number of persons who suffer every year from malaria in India is not less than 50 millions and may easily exceed 100 millions in some years'.

Of over 11½ million cases treated in hospitals during the year, 15 per cent were from malaria, and it appears that of all diseases this is the most general cause of human distress and economic loss in India.

Whilst large parts of India are malarious, all are not equally so. The plains of Central and Western Bengal, most of Assam, the Doon, the Terai of the United Provinces, the hilly submontane slopes of the Eastern and Western Ghats are all very malarious places, but the plains of the United Provinces and the Punjab, though they may be at times extremely malarious, are not always so. Malaria rarely occurs in the hills above 5,000 feet, but several of the most malarious parts of India are in the valleys running into the hills at a level of 1,500 to 2,000 feet.

The effects produced by the operation of the Lloyd Barrage scheme on the incidence of malaria in Sind have recently been considered, and the principal factors which have produced an adverse effect are stated to be a rise in the subsoil water level in many areas, actual or threatened water-logging of the soil in certain areas, seepage from some of the new canals, the cutting off of sections of certain of the old canals thus forming prolific anopheline breeding grounds, the formation of a 'lake' above the Barrage, with a corresponding rise of the subsoil water level along the course of the Indus, and an extension in rice cultivation in areas outside the Barrage Command in Northern Sind.

**Anti-malarial measures.**—The sums spent on anti-malarial measures in nine provinces, for which figures are available, are approximately as follows:—

Delhi Rs. 31,000, Central Province Rs. 42,000, Madras Rs. 57,000, Assam Rs. 67,000, Bengal Rs. 3,00,000, Bombay Rs. 55,000, Coorg Rs. 7,000, and Burma Rs. 47,000.

Most of this expenditure was on quinine.

Under present arrangements, the quinine and cinchona febrifuge requirements of Bengal, Bihar and Orissa and Assam, as well as the Indian States within

their geographical limits, are met from the Bengal Government Quinine Factory at Mungpoo. The Punjab and the United Provinces also obtain a part of their supplies from this factory. The main supplies for the Punjab, including its states, and for the United Provinces, Rajputana, North-West Frontier Province, Baluchistan, Delhi and Gwalior, come from the Government of India stock under the control of the Director, Botanical Survey of India, Calcutta. For the rest of British India and the remaining Indian States, supplies are obtained from the Madras Government Factory at Naduvattam.

During the year 1934, 26,244 lb. of quinine, 18,886 lb. of cinchona febrifuge, and 20 lb. of totaquina were issued free and 11,202 lb. of quinine, 3,656 lb. of cinchona febrifuge and 2,415 lb. of totaquina were sold.

*Dysentery and diarrhoea.*—Of the total number of deaths, about 285,000, from dysentery and diarrhoea, 148,000 occurred among males and 137,000 among females.

Conditions of urban life seem to favour the spread of these diseases and amongst these mention may be made of defective conservancy arrangements, bad water supplies, and overcrowding of the city life. Except in Delhi Province, the urban death rate was higher than the rural in every province, the urban rate for the whole of British India being 2.1 and the rural 0.9. In the Punjab most of the municipalities, which were content to entrust their conservancy arrangements to contractors, record a comparatively higher dysentery death rate than those which carried out the work themselves.

*Enteric fever.*—Deaths from enteric fever numbered about 86,000. The disease is said to be endemic in the urban areas, where it is ascribed to infected water supplies, contaminated food and flies. The generally unsatisfactory condition of water supplies, conservancy and drainage are all important factors in this connection.

*Respiratory diseases.*—The death rate per mille from respiratory diseases in British India was 1.8. In Bengal the increased mortality from this disease is attributed to the greater prevalence of influenza, which alone was responsible for about 48 per cent of the deaths classified as respiratory diseases.

*Tuberculosis.*—The wide distribution of tuberculosis of recent years must in a considerable measure be due to increase of urbanization and the environmental factors associated therewith, producing overcrowding and other conditions which predispose to this disease. The present position would appear to be that, whereas the towns are heavily infected, and their residents tuberculized to some extent, the rural population for the most part has not yet experienced the full force of the disease. A much greater spread of tuberculosis among the rural population, facilitated by the rapidly increasing means of communication, is therefore a very likely thing to happen.

Generally speaking, the population of India is highly susceptible to tuberculosis, and amongst most of them the disease takes a virulent form and runs a rapid course. Environmental sanitation in India is definitely backward, and in particular the housing problem is exceedingly difficult. Many urban areas have bad or indifferent building by-laws, and there is a tendency to enforce these, such as they are, very inadequately. Year by year, housing conditions are created in many towns favourable to the rapid spread of tuberculosis. The problem ultimately is one of improving housing in urban areas with all that this connotes in the way of space, sunlight and fresh air. To tackle the problem from any other aspect than this is to begin at the wrong end. It is beyond the financial resources of the country to build hospitals and sanatoria to house our countless cases of tuberculosis, unless we can reduce markedly the number of fresh cases infected each year, by improvement of environmental conditions. The importance of good nutrition too cannot be overstressed, but there is evidence of increased attention being paid to this vitally important subject.

In the previous year, Sir John Megaw, Director-General of the Indian Medical Service, estimated that there were probably two million cases of tuberculosis in India. His conclusions are that tuberculosis is very widespread throughout the villages of India, but is specially serious in Bengal, Madras, the Punjab and Bihar and Orissa. Pulmonary tuberculosis seems to be much more common than extra-pulmonary except in the United Provinces and Bombay. The low incidence in the Central Provinces is remarkable, and is perhaps associated with the sparse distribution of the population and with defective means of communication. Tuberculosis is well known to be exceedingly prevalent in the cities and large towns, but little is known as to its incidence in rural areas. It seems likely that the disease is increasing steadily and rather rapidly, and the estimate of just over two million cases as a whole is probably much too low. The proportion of tuberculosis cases to total cases treated in hospitals, which is 0.3, is probably the best indication of the relative incidence of tuberculosis.

Although mortality figures, differentiated according to sex, are not available, the fact that females are more severely infected than males is evident from the high female death rates from respiratory diseases.

The King George's Thanksgiving (Anti-tuberculosis) Fund is the only all-India organization dealing with tuberculosis. The fund has a central committee and branches in the provinces, and concerns itself both with prevention and treatment, and, in addition to carrying out propaganda, provides training for medical men in tuberculosis work. The local voluntary organizations doing anti-tuberculosis work number 24, and the institutions which provide for the treatment of tuberculosis number 29.

*Hookworm.*—Of the number of cases suffering from hookworm treated in British India, much the highest number, as usual, was recorded in the Madras Presidency. In a total of 211 thousand, nearly 166 thousand come from Madras, 22 thousand from Bihar and Orissa, and 6 thousand from Bengal.

The rural sanitation campaign in Madras continued its anti-hookworm activities. Cinema shows, lantern lectures and talks were given to huge audiences; over 193,000 treatments for hookworm were given by rural sanitation dispensaries and other staffs, while 2,500 new latrines were built mainly in Madras district. A survey in some of the districts revealed a very high incidence rate, hookworm being found in 90 per cent of the stool specimens examined.

*Leprosy.*—Although leprosy has been known in India for over 3,000 years, census enumerations have been the sole index of the extent of its prevalence since 1872, when the first census was taken. But the census figures are not always reliable, only the most advanced and obvious cases being registered by lay enumerators. In 1925, the Indian Council of the British Empire Leprosy Relief Association, otherwise known as 'BELRA', was formed, with an endowment yielding an annual income of nearly Rs. 1½ lakhs. In early years, this organization, through its provincial branches, confined its activities to research, propaganda, and the training of doctors. But in 1927, it began experimental surveys of selected areas to find out the relative incidence of leprosy in different parts of India, the class of people among whom it was most rife and the causes of high incidence. The areas surveyed included 4,560 villages in 30 districts and 66 municipal towns. Amongst the main conclusions arrived at were the following: (1) that leprosy was much more prevalent in India than was formerly supposed; probably a million cases would not be an over-estimate; (2) that leprosy was most common in semi-aboriginals or aboriginals who left their tribal seclusion and hired themselves out to agriculturists or to industrial concerns. As a sequel to these surveys, a network of clinics has sprung up in endemic areas, of which 34 are in the Punjab, 118 in the United Provinces, 15 in Bihar and Orissa, 164 in Bengal, 28 in the Central Provinces, 36 in Bombay, 405 in Madras, and 171 in Assam.

The Mission to Lepers, founded by Mr. Wellesley Bailey 60 years ago, is another important private organization which is devoting itself to the care and treatment of lepers. The Mission has now 36 homes throughout India. Through the generosity of the Indian Council of the BELRA and the authorities of the Calcutta School of Tropical Medicine, training in modern methods of treatment has for some years been provided in Calcutta, and during the five years ending 1934, 436 doctors have been so trained.

As a result of the detailed research and survey work carried out in India during the past ten years, the leprosy problem has been defined and its dimensions gauged. Treatment has been substantially improved. Early cases now come forward far more readily than formerly. But we still lack a sure satisfactory cure for the disease and a solution of the segregation problem.

(To be continued in the next issue)

## BENGAL PUBLIC HEALTH REPORT FOR THE YEAR 1935. BY DR. S. N. SUR, D.P.H., OFFICIATING DIRECTOR OF PUBLIC HEALTH, GOVERNMENT OF BENGAL

### POPULATION

The estimated mid-year population of Bengal for the year 1935 was 51,231,433.

### BIRTHS AND BIRTH RATES

The number of live births registered during 1935 was 1,634,129, of which 848,369 were males and 785,760 females against 1,464,520, 759,722 and 704,798, respectively, in 1934. The birth rate was 32.7 per mille of population in 1935 against 29.3 in 1934. Compared with last year and the previous quinquennium the birth rate in 1935 showed an increase of 3.4 and 5.1 per mille of population, respectively. The year under review recorded the highest rate of births since 1919. The proportion of male births to every 100 female births in 1935 was 108 against 107 in 1934.

Calcutta recorded the lowest birth rate in 1935, i.e., 22.2 per mille.

As in the previous year, the Darjeeling district recorded the highest birth rate, i.e., 40.1 per mille.

Altogether 72,558 stillbirths were registered in Bengal during 1935, i.e., 4.4 for every 100 live births, the figures for the previous three years being 53,580 in 1934, 52,481 in 1933 and 46,742 in 1932. It appears that this incidence is gradually increasing year after year. The proportion of stillbirths to total births was 4.25 per cent in 1935 against 3.53 in 1934, 3.44 in 1933 and 3.40 in 1932.

### DEATHS AND DEATH RATES

During the year 1,131,427 deaths were registered in the province, representing a death rate of 22.7 per mille from all causes. The corresponding figure for the year 1934 is 1,176,887 or 23.6 per mille and 22.3 during the previous quinquennium. The death rate of 1935 showed a decrease of 3.8 per cent as compared with that of 1934. Against the quinquennial average, it showed an increase by 1.8 per cent of 589,225 males and 542,202 females died during the year as against 610,731 males and 566,156 females during 1934. One hundred and eight males died to every 100 females.

Fifteen thousand six hundred and eight deaths from maternal causes were registered, compared with 13,692 deaths in 1934.

**Infant mortality.**—Two hundred and fifty-nine thousand and thirty-six infants under one year died in 1935 as compared with 277,194 in 1934. The death rates for 1935 and 1934 were 158.5 and 189.2 per 1,000 births, respectively. This represented 22.9 per cent of the total provincial deaths. 59.3 per cent of the total infant mortality were recorded among infants under one month.

The need for greater attention to maternity and child-welfare work, both in urban and rural areas, is an obvious one; and it is hoped that the local authorities will be in a position to devote an increasing share of their resources to the solution of this important problem.

**Cholera.**—There were 59,605 deaths from cholera in 1935 against 50,742 in 1934; this represented an increase

of 20 per cent on the mortality of the previous year and on the average of the previous quinquennium, 5.3 per cent of the total provincial mortality were due to this disease. As in the previous year, the rate of mortality from this disease was higher than in any other province except Central Provinces and Bihar and Orissa. Darjeeling was free from cholera during the year. Of the total deaths 4,770 occurred in towns and 54,835 in the rural areas. The total number of inoculations performed was 2,329,326 against 2,106,269 in the previous year. Other preventive measures included disinfection of sources of water supply, provision of facilities for the inoculation of pilgrims, assistance to various local authorities in anti-cholera work and educative propaganda work by means of magic lantern and bioscopic film demonstrations together with the distribution of leaflets and posters on cholera.

**Smallpox.**—Smallpox was responsible for 7,548 deaths against 8,296 in 1934, showing a reduction in the death rate from 0.2 to 0.1 per mille. The death rate was highest in April, May and December and lowest in October, but was lower in every month except December than in the corresponding months of the previous decade. Calcutta alone was responsible for 1,173 deaths, or 51.7 per cent of total deaths in towns; the incidence in Calcutta (1.03 per mille) was higher than in the previous year but was lower than that of the preceding decade. Jessore, Khulna and Darjeeling, with a death rate of 0.01 per mille each, were the least affected districts.

The number of persons vaccinated increased from 6,791,962 in 1934 to 9,106,830 in 1935. Although this number is the highest as yet recorded in a year it includes over 6,000,000 cases of revaccination and there are grounds for believing that more than four-fifths of the total population of the province still remain unvaccinated.

The average cost of each successful case of vaccination was one anna and six pies against one anna and nine pies in the previous year. The average cost of the manufacture of vaccine lymph per dose of half a grain was 1.4 pies only.

**Malaria and kala-azar.**—Mortality from fevers fell from 764,492 in 1934 to 705,628 in 1935, the death rate being 14.1 per mille of population against 15.3 in 1934 and 14.8 during the last quinquennium. Malaria accounted for 342,955 and kala-azar for 17,469 of these deaths, as against 387,191 and 14,763, respectively, in the previous year. Rangpur recorded the highest rate of fever mortality (22.6 per mille) while, as in the previous year, the rate was the lowest in Calcutta (3.7 per mille).

Fever indices for 1935 show the incidence of malaria to be the highest in Jessore (15.5 per cent), and in excess of 40 per cent in Burdwan (49.3), Nadia (48.7), Jalpaiguri (44.7), Rangpur (44.5), Hooghly (43.6), Birbhum (43.0), Khulna (42.6) and Dinajpur (41.9).

The death rate from kala-azar continued to show a slight increase, viz, 0.29 to 0.35 per mille. The number of new kala-azar cases admitted for treatment increased from 121,142 in 1934 to 138,274 in 1935, the increase being most marked in Rangpur, Bogra, Bakarganj, Noakhali, Tippera and Faridpur. On the other hand, Burdwan, Hooghly, Murshidabad, Rajshahi and Dinajpur showed a noticeable decrease in the number of such cases.

Compared with 1934 the death rate from kala-azar decreased in towns by 11.1 per cent and in Calcutta by 23.5 per cent, but there was an increase of 20 per cent in the rural areas. The mortality from kala-azar was the highest in the town of Jessore (1.3 per mille).

The experiment in the intensive treatment of the population with quinine and plasmochin, which was initiated in 1933 in the Memari thana in the district of Burdwan, was continued during the year. It was reported to have resulted in a marked reduction in the incidence of malaria within the area selected; but as the year of review was, till the preceding year, one of unusual drought, it was not possible to make any

conclusive deduction from the results, and it was accordingly decided to continue the experiment.

Free distribution of quinine in five selected thanas in Western Bengal was continued during the year.

The campaign against *Anopheles ludlowii* in the Salt Lake area, which continued to be a menace to Calcutta, had to be suspended in February 1935 owing to the non-receipt of contribution from the Corporation of Calcutta towards the control measures in this section. This had an obviously unfortunate consequence, as almost all the villages in the Salt Lake area were reported to be breeding *Anopheles ludlowii* during the year. Many new foci for the species were also discovered along the banks of the river Hooghly, Bidyadhari and Ichamati and elsewhere and also in certain places within the jurisdiction of the Corporation of Calcutta.

*Ludlowii* control measures were successfully undertaken towards the end of the year at Budge Budge with the co-operation of the jute mill authorities, the local municipality, and the district board of the 24-Parganas. Similar measures were undertaken in the Chengail area by the Bengal-Nagpur Railway in collaboration with some jute mills and the district board of Howrah. The East Indian Railway authorities continued to take anti-larval measures in the railway settlement, Lillooah.

**Respiratory diseases.**—Respiratory diseases accounted for 84,868 deaths in 1935 against 85,113 in 1934, representing, respectively, 7.5 and 7.2 per cent of the total provincial mortality in these two years.

Pneumonia was responsible for 41,938 of these deaths as compared with 41,006 in 1934, representing a death rate of 0.84 against 0.82 per mille in 1934.

There were 16,525 deaths from phthisis against 14,845 in the previous year, showing an increase of 10 per cent which was shared by all but eight districts. Darjeeling returned the highest death rate (2.9 per mille) followed by Calcutta (2.5 per mille).

**Other diseases.**—Enteric fever accounted for 0.8 per cent of the total provincial mortality. The number of deaths from the disease was 8,709 during the year against 9,754 in 1934. The death rate decreased by 11.8 per cent in rural areas, by 2 per cent in urban areas and by 5 per cent in Calcutta.

Dysentery took a toll of 27,349 lives and diarrhoea of 24,581 in 1935 as against 29,674 and 24,273, respectively, in 1934. As in the previous year, these two diseases accounted for 4.6 per cent of the total provincial mortality. The combined death rate was highest in Darjeeling (3.86 per mille) and Howrah (3.52 per mille).

**Leprosy.**—Survey and propaganda by the British Empire Leprosy Relief Association had drawn the attention of the local authorities to the growing incidence of leprosy in the province, with the result that more than 200 leprosy treatment clinics were established in several districts. In the district of Bankura alone, which is reported to contain about 45,000 lepers of whom about 40 per cent are infective, 133 leprosy relief committees were formed by union boards up to the year under review. During the year 1935, 21 leprosy clinics were maintained by union boards, 6 by the district board and 2 by missions. More than 5,000 cases were treated in these clinics.

**Fairs and festivals.**—Satisfactory arrangements were made by the Public Health Department and the local authorities concerned for the prevention of the outbreak of infectious diseases at the Ganga Sagar and Nangalbandha melas which are attended every year by a large number of pilgrims. Out of 15 cases of cholera which occurred at the Ganga Sagar mela, five ended fatally; while at Nangalbandha, where there were a lakh of pilgrims, there were only two cases but no deaths.

**Sanitary works including water supply.**—Rs. 47,86,558 or 42.0 per cent of the total receipts (including opening balance) of municipalities were spent on sanitary works during the year 1934-35, showing a decrease of 3.1 per cent from the previous year's expenditure. The

average expenditure per head of municipal population was Rs. 2-1-3.8. Rupees 26,09,596 were spent on conservancy, Rs. 10,12,699 on water supply and Rs. 3,35,298 on drainage. The expenditure of district boards on water supply, drainage and sanitation remained almost stationary; 2.7 per cent of their income were spent on water supply, 0.1 per cent on drainage and 9.7 per cent on sanitation (including vaccination) against 2.9, 0.1 and 9.9, respectively, in the previous year. During the year the union boards spent Rs. 6,26,582 on water supply, Rs. 65,180 on drainage and Rs. 73,878 on conservancy. Their total expenditure was Rs. 91,16,871 against Rs. 90,12,874 in the previous year.

**School hygiene.**—In Calcutta, three Government school medical officers and medical officers attached to particular institutions carried out a systematic inspection of school children; they visited over 100 schools and examined altogether 7,980 scholars, of whom 34.7 per cent were found to be well nourished and 18.8 per cent ill nourished. 12.8 per cent of the students were reported to have defective teeth and 14.5 per cent to be suffering from enlarged tonsils, while 23.1 per cent were found to be suffering from eye troubles.

In other municipal towns, 72 schools were visited by 26 medical officers who examined 8,102 pupils. Of these, 31 per cent were found to be well nourished and 25.5 per cent ill nourished. 10 per cent had defective teeth and 9 per cent were found to be suffering from eye troubles; only 1.8 per cent of the students had enlarged spleen.

There was a marked increase in the number of inspections made by rural sanitary inspectors who visited 5,595 schools against 4,865 in the previous year, and inspected 172,032 pupils against 147,599 in 1934.

**Educational propaganda.**—Altogether 1,680 lectures and demonstrations on sanitation, including cinematograph shows, were given by the twelve units of publicity staff employed under the Public Health Department.

The Public Health publicity staff also rendered valuable assistance to about 100 exhibitions in the mofussil and 30 in Calcutta. The Government exhibition van, in which a cinema party toured in the rural areas, held 84 exhibitions in the districts of the 24-Parganas, Jessore and Midnapore, attended by an aggregate number of about two lakhs of people. Educative propaganda through the radio was continued during the year and lectures were given on various public health subjects. About 60,000 leaflets and 20,000 posters on health subjects were distributed throughout the province. Four new films on sanitation were prepared during the year.

**General.**—Although, owing to financial stringency, the Public Health Department was not in a position to take up any new scheme, its normal activities were continued without any serious curtailment. Besides finding a moiety of the charge on account of health officers employed by the local authorities, a sum of Rs. 10,97,500 was provided to assist district boards in maintaining their rural health units, the assistance being limited to a maximum of Rs. 2,000 for each thana unit. In addition to a sum of Rs. 2,02,000 allotted from the Government of India's subvention for rural uplift, a sum of Rs. 2 lakhs was spent for the improvement of drinking water supply in rural areas. Other grants included Rs. 70,000 for combating kala-azar, Rs. 45,000 for free vaccination, Rs. 2,30,000 for anti-malarial measures and for the free supply of quinine. A grant of Rs. 10,000 was made to the Tuberculosis Association and a small grant (Rs. 5,500) to the Bengal Branch of the British India Leprosy Relief Association for carrying on propaganda against tuberculosis and leprosy, respectively.

The Public Health Department continued to render valuable assistance to the local authorities on the occasion of serious outbreaks of epidemic diseases, by sending extra staff, drugs and disinfectants to supplement their resources.



## Correspondence

### SCHOOL CHILDREN AND DENTAL DISEASE

*To the Editor, THE INDIAN MEDICAL GAZETTE*

SIR,—According to the statement of Dr. R. N. Ghosh, D.D.P. (Paris), P.G.Dent. (Eng.), Calcutta, 70 per cent of the school-going children are suffering from diseases of the teeth and its consequent manifestations on the growth and development of the body. This fact has been revealed in an exhaustive examination of the children in the different schools of the city by Dr. Ghosh and a few other colleagues in the profession.

Yours, etc.,

SECRETARY, CALCUTTA DENTAL CLUB.

17-2, CHOWRINGHEE,  
CALCUTTA,  
21st April, 1937.

### CLINICAL STUDY OF SIXTY-THREE CASES OF ORIENTAL SORE

*To the Editor, THE INDIAN MEDICAL GAZETTE*

SIR,—With reference to Captain J. Goodall's article on oriental sore, I was in Quetta for ten months after the earthquake and we had the same experience with oriental sore there as had Captain Goodall—roughly 500 cases among troops and followers. One man, an Indian King's Commissioned Officer had about 230 sores on him. I saw one other case with over 200 sores, and figures over 100 were not uncommon. It was suggested that the huge heaps of rubble in the city were exceptionally good breeding ground for sandflies and therefore indirectly the cause of this epidemic.

Although I cannot quote from the same valuable statistical figures as Captain Goodall, I can say that my own experiences with antimony (trivalent and pentavalent compounds) and emetine conform to the results obtained by Captain Goodall and, of course, are quite unsatisfactory. Berberine was mainly used in the British Military Hospital and their reports were just as unsatisfactory. From the start the results of treatment with these drugs were carefully watched and compared with each other and with the procedure of scraping the sore and earbolizing. Excising the ulcer was tried in two selected cases but discarded at once owing to inability to maintain asepsis. However, the results of scraping and earbolizing were so dramatically successful and vastly superior to the medical treatment that it became routine treatment. Captain de L. Carey, I.M.S., then suggested intravenous injection of 10 c.cm. of 10 per cent calcium chloride on alternate days for selected cases that did not seem suitable for the surgical procedure. I have forgotten the authority Captain Carey quoted. Such cases were sores on the eyelid of great multiplicity. This treatment dried up the sores much more quickly than the antimony salts and was not toxic. However, it scleroses the veins and therefore has a limited application.

The scraping was so much the best procedure that I will briefly describe the points in it.

It was done under nitrous oxide gas. Occasionally, there were two or more operations taking an area each, e.g., two limbs or the face. Scraping is very firm and vigorous indeed with a Volkman's spoon or curette. One invariably reached a dense fibrous base through which it was almost impossible to scrape. The material scraped away was cheesy and friable. The edge of the wound including apparently healthy skin also came away. The picture is so characteristic that if it is not met with, one can assume a wrong diagnosis. The oozing was then stopped for a moment by gauze pressure and the whole raw area painted with pure liquid carbolic acid. Finally, the wound is covered directly

with elastoplast—or adhesive strapping in its absence—without intervening gauze or other dressing, and the whole bandaged up. The strapping or elastoplast was not removed for 14 days. The discharge from beneath it became gradually less, and at the end of 14 days, even in the case of wounds two inches in diameter, wonder of wonders, the whole was healed up and epithelialized over practically every time. About one in ten had to be washed with spirit and earbolized and re strapped, and were healed at the end of the next 14 days. And about one in 100 sores had to be scraped a second time—never a third time in our experience. More and more one found with experience that sores on such parts as the nose, ears and eyelids could be treated cautiously and successfully in this way, thanks to the limiting fibrous floor mentioned above; 15 to 20 sores could be scraped at one session.

And here is just one more point of great interest. One of our sub-assistant surgeons for whom I had advised scraping and earbolizing, did not fancy the scraping, so just touched the small new sores with pure carbolic twice a week and they reacted splendidly. We subsequently used this treatment as a routine in very small sores and I believe it was going to prove 100 per cent successful but I left Quetta before I could completely make up my mind on that point.

Captain Goodall got good effects from iodine but used it late in the disease. Perhaps he would have got even better results by using it from the start since a strong antiseptic like acid carbolic was effective.

I now dare to give the opinion that there is little or no place for antimony, emetine or berberine in the treatment of oriental sore and only a little more for intravenous calcium chloride.

Captain Carey, Captain Leach and Captain Mirza, all I.M.S., were my colleagues at this work and would probably be willing to verify these claims. Jemadar Sahib Ladhia Ram and Miss Moran, I.M.N.S., also saw the results.

Yours, etc.,

R. L. RAYMOND,

CAPTAIN, I.M.S.

Medical Officer in charge of  
Wa State, B.M.P. Forces.

PANGHSANG,  
LASHIO, BURMA,  
30th March, 1937.

[Note.—It is a very great pity that Captain Raymond and his colleagues did not collect accurate data regarding the results of different forms of treatment; and it is particularly regrettable that more details regarding the failure of the antimony compounds are not available.]

Those who have had experience elsewhere have found the response to antimony injections seldom dramatic and nearly always slow, and when sores are heavily infected with other organisms local treatment has also had to be given. But in most cases they do eventually respond.

It is possible that the rate of response was not sufficiently rapid for the impatient surgeon. On the other hand Captain Raymond may be quite right and scraping may be the method of choice; it is therefore very unfortunate that he cannot give scientific data in support of this opinion. It will have to remain a clinical impression and as such will carry little weight. Frequently in the past, procedures very similar to that recommended by Captain Raymond have been suggested, adopted and abandoned.—L. E. N., EDITOR, I. M. G.]

### THE USE OF GOLD IN PULMONARY TUBERCULOSIS

*To the Editor, THE INDIAN MEDICAL GAZETTE*

SIR,—I have read with some interest the observations of Dr. J. C. Banerjee on chrysotherapy in the special tuberculosis number of the *Indian Medical Gazette* (April issue). While I appreciate many of the points

discussed by the writer, I find myself unable to subscribe to his view that 'the value of gold treatment remains still unproven'. It is true that America, in general, does not believe in the efficacy of gold treatment. I gathered this impression during my tour to that country from my talks with Amberson who along with McMahon and Pinner has found that the kidneys are invariably damaged by gold, even though no evidence of it may be present in urine. However, the fact that gold is still being used in many countries after a trial of several years is sufficient reason to believe in its efficacy and it must be admitted that gold has come to stay in the treatment of pulmonary tuberculosis.

Various preparations of gold are available in the market. They may roughly be divided into three groups:—

- (1) Soluble compounds in an aqueous solution.
- (2) Soluble compounds in an oily suspension.
- (3) Insoluble compounds in an oily suspension.

In preparing the various compounds of gold an attempt has been made to reduce their toxic effects and increase their therapeutic value in the Ehrlich sense and the value of different gold salts can be ascertained by determining the 'therapeutic value' of each preparation.

I have used different compounds such as krysolgan, triphal, lopion, sanoerysin, solganal, crisalbine, solganal-B, lypocrysol, oleo-sanoerysin, and solganal-B oleosum. Sanoerysin and crisalbine are the same compound (thiosulphate of gold and sodium) under different names.

After a practical experience of several years I have begun to agree with Schröder that it is better and safer to use oily preparations. The advantages obtained from them are (1) they can be administered easily by the intramuscular route, (2) absorption of the drug takes place slowly, (3) prolonged action is obtained, and (4) the reactions and toxic effects of the metal are reduced to a minimum. The fact that oleo-sanoerysin had later to be placed on the market shows the importance of the oily preparations of gold. In my experience solganal-B oleosum has given satisfactory results in suitable cases and I have found it less toxic than oleo-sanoerysin.

I have not been able to persuade myself to adopt the fractional—shall I say homeopathic—doses advocated by the Calcutta doctors. I am in agreement with Burrell that larger doses are harmful and smaller doses are useless. My usual practice is to give first and second doses of solganal-B oleosum once each, third, fourth and fifth doses twice each, and the sixth dose thrice. The injections are given at intervals of a week or so and I have not so far seen any harm done to a patient.

Gold treatment has been found to be of value in pulmonary tuberculosis of fairly recent origin although in cases of long standing improvement has sometimes been found to occur. The complication of intestinal tuberculosis in pulmonary cases should be borne in mind when using gold and I have elsewhere discussed its use in the primary type of intestinal tuberculosis. The beneficial results from a combination of collapse-therapy and gold treatment are admitted. While it is safe to combine artificial pneumothorax for the more advanced lung with gold treatment in very advanced cases for reasons mentioned by Frimodt-Møller, this may not be possible in every case on account of the presence of adherent pleura, and I believe that the dangers may be lessened by the cautious use of solganal-B oleosum.

To sum up, it seems to be well established that gold has certain therapeutic value when properly used in selected cases. The chemotherapy of gold in the Ehrlich sense has been found to be a dream and not a reality. The bactericidal action attributed to it by Möllgaard has been discarded. The popular view now is that gold acts like a catalytic agent and brings about the acceleration of slow spontaneous healing processes by stimulating the activity of the reticulo-endothelial cells. What is therefore, called chemotherapy of gold is in reality 'stimulation-therapy'.

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Yours, etc.,

Y. G. SHRIKHANDE, M.Sc., M.A., B.S.,  
 T.N.D. (Wales),  
 Medical Superintendent.

KING EDWARD VII SANATORIUM,  
 BHOWALI, U. P.,  
 6th May, 1937.

## Service Notes

## APPOINTMENTS AND TRANSFERS

MAJOR-GENERAL D. S. SKELTON, C.B., D.S.O., K.H.S., Brit. Serv., is appointed Officiating Director of Medical Services in India, Army Headquarters, *vice* Major-General E. A. Walker, C.B., K.H.S., on leave from 7th March, 1937.

Colonel H. C. Buckley, V.H.S., Inspector-General of Civil Hospitals, U. P., is appointed Surgeon-General with the Government of Bombay, with effect from the forenoon of the 1st March, 1937.

The services of Lieutenant-Colonel W. Ross Stewart, C.I.E., are placed temporarily at the disposal of the Government of the Punjab, with effect from the forenoon of the 10th February, 1937.

Lieutenant-Colonel B. H. Kamakaka, M.C., is posted as Residency Surgeon and Chief Medical Officer in Baluchistan. Dated 31st March, 1937.

Captain A. K. Gupta, Civil Surgeon, Rajshahi, on relief, is posted to Berhampore, Murshidabad, *vice* Lieutenant-Colonel N. C. Kapur, transferred.

Lieutenant-Colonel N. C. Kapur, Civil Surgeon, Murshidabad, on relief, is posted to Chittagong, *vice* Captain G. B. W. Fisher, transferred.

Captain G. B. W. Fisher, Civil Surgeon, Chittagong, on relief, is posted to Darjeeling, *vice* Major J. C. Drummond, transferred.

Major J. C. Drummond, Civil Surgeon, Darjeeling, on relief, is appointed to act as Surgeon-Superintendent, Presidency General Hospital, *vice* Lieutenant-Colonel H. E. Murray, transferred.

Lieutenant-Colonel H. E. Murray, Surgeon-Superintendent, Presidency General Hospital, Calcutta, on relief, is appointed to act as Professor of Midwifery, Medical College, Calcutta, *vice* Lieutenant-Colonel P. F. Gow, granted leave.

Lieutenant-Colonel J. P. Canteenwalla is appointed to officiate as Assistant Director-General, Indian Medical Service (Stores), *vice* Lieutenant-Colonel W. M. Will, granted leave.

The services of Major S. C. Alagappan are placed temporarily at the disposal of the Government of Madras, with effect from the afternoon of the 17th February, 1937.

Captain C. K. Lakshmanan is appointed as Officiating Port Health Officer, Bombay. Dated 3rd April, 1937.

Captain S. Annaswami is transferred to Jail Department, Bengal, from the date he assumes charge of his duties.

Captain M. Jafar is appointed as Officiating Port Health Officer, Calcutta. Dated 31st March, 1937.

Captain J. R. Dogra is appointed to officiate as Assistant Director, Central Research Institute, Kasauli.



## LEAVE

Lieutenant-Colonel P. F. Gow, Professor of Midwifery, Medical College, Calcutta, is granted leave for 3 months and 15 days, with effect from the 14th May, 1937, or from any subsequent date from which the leave is availed of.

Lieutenant-Colonel P. Bannerji, Officiating Superintendent, Campbell Medical School and Hospital, Calcutta, is granted leave for 7 months and 25 days, with effect from the 28th February, 1937, or any subsequent date.

Previous notifications are hereby cancelled.

Lieutenant-Colonel W. M. Will, Assistant Director-General, Indian Medical Service (Stores), is granted combined leave for 6 months and 27 days, with effect from the 23rd April, 1937, and subsequent date from which he may avail himself of it.

Lieutenant-Colonel J. Rodger, M.C., is granted leave on average pay for 7 months. Dated 31st March, 1937.

Major W. D. B. Read, Officiating Assistant Director, Central Research Institute, Kasauli, is granted leave on average pay for 4 months and 2 days ex-India, with effect from the 6th April, 1937, or any subsequent date on which he may avail himself of it.

## PROMOTIONS

## Majors to be Lieutenant-Colonels

- S. N. Makand. Dated 1st March, 1937.  
A. C. Alagappan. Dated 3rd March, 1937.  
B. R. Chaudhuri. Dated 22nd March, 1937.

## Captains to be Majors

- W. J. Shipsey. Dated 1st October, 1936.  
M. P. Conroy. Dated 3rd March, 1937.

## Lieutenants (on probation) to be Captains (on probation)

S. C. Colbeck. Dated 10th January, 1937, with seniority from 1st September, 1936.

J. H. Bowie. Dated 9th January, 1937, with seniority from 1st September, 1936.

W. S. Ampey. Dated 9th January, 1937, with seniority from 1st September, 1936.

A. G. Miller. Dated 9th January, 1937, with seniority from 1st September, 1936.

E. H. Wallace. Dated 27th December, 1936.

J. F. Thomson. Dated 17th March, 1937.

The seniority of the undermentioned officers is antedated as follows:—

Lieutenant C. H. Bliss to 1st November, 1935.

Lieutenant W. A. H. Mitchell to 1st March, 1936.

Lieutenant R. B. Davis to 13th June, 1936.

## RETIREMENTS

Lieutenant-Colonel L. Blake, M.C., on account of ill health. Dated 3rd March, 1937.

Lieutenant-Colonel A. J. Lee. Dated 6th March, 1937.

## RELINQUISHMENT

Lieutenant (on probation) W. Laurie relinquishes his probationary appointment. Dated 29th January, 1937.

## Note

## DETTOL

Temporary claims have been made for 'Dettol', an antiseptic which is widely used in England. These claims have been examined within the past year or two and no claims have appeared in the medical press by Dr. Colebrooke of Queen Charlotte's Hospital. It will be sufficient to mention that when Dr. Colebrooke applied to the firm and allowed

to dry it confers protection against infection by hæmolytic streptococci for a period of at least two hours afterwards. He has also stated that a 2 per cent solution of 'Dettol' was found to destroy hæmolytic streptococci and *B. coli*, even in the presence of pus, within two minutes. This and other findings are given in the *Journal of Obstetrics and Gynecology of the British Empire* (Vol. XL, No. 6, October 1933). In a more recent paper in the same journal (Vol. XLIII, No. 4, August 1936), Dr. Colebrooke states that since the introduction of 'Dettol' into the hospital in 1933, the incidence of infection due to all grades of hæmolytic streptococci has been reduced by more than 50 per cent, when compared with a similar period immediately prior to the introduction of 'Dettol'. A significant mention is that since there has been no other change in antiseptic procedure the improvement can fairly be ascribed to 'Dettol'.

Briefly 'Dettol' is three times as efficient a germicide as pure carbolic acid when tested against *Bacillus typhosus* according to the Rideal-Walker method. It is non-poisonous, non-staining to linen and skin and is an excellent deodorant. Its combination of properties enables it to be used at really effective strengths on the skin and mucous membrane.

'Dettol' would appear to be an antiseptic which can be confidently relied upon for general surgery use, including skin sterilization and the treatment of major and minor wounds and burns, for obstetric and gynecological purposes, and for general recommendation to patients.

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## Original Articles

## TELERÖNTGENOGRAPHY OF THE HEART IN EPIDEMIC DROPSY

By R. N. CHOPRA, C.I.E., M.A., M.D. (Cantab.),  
M.R.C.P. (Lond.)

BREVET-COLONEL, I.M.S.

Honorary Physician to H. M. the King-

R. N. CHAUDHURI, M.B. (Cal.)

and

P. C. SEN GUPTA, M.B. (Cal.)

(From the School of Tropical Medicine, Calcutta)

TELERÖNTGENOGRAPHY is a method first introduced by Köhler (1935) in 1904-1905 for obtaining an exact determination of the size and form of the heart, but it was hardly made use of until recent years. A great change has taken place in the attitude of the profession in this country towards this useful diagnostic measure. While a few years ago hardly anyone thought about it, clinicians now use it often as part of the routine examination in the different cardiac disorders. A teleradiogram furnishes accurate permanent

to the median line to the greatest convexity of the heart shadow to the right and to the left, indicates the transverse diameter of the heart, the sum of  $x$  and  $y$ , the lines drawn perpendicular from  $D^1$  and  $G$  to the line  $D G^1$ , is the oblique diameter.  $D D^1$  gives a measure of the right auricle, and  $G G^1$  that of the left ventricle; length of the line drawn perpendicular to the middle line from  $G$  gives the measure of the left auricle and  $D^1 G^1$  that of the right ventricle. To obtain the auriculo-ventricular ratio the line  $D G^1$  is divided into two segments by joining  $D^1 G$ ; the upper segment represents the auricle and the lower one the ventricle. The fraction obtained by dividing the length of the upper segment by that of the lower is called the auriculo-ventricular ratio. The other measurement is the bisector  $B$ , a perpendicular to  $G G^1$  at the greatest convexity of the left ventricle, which indicates the thickness of the wall of the left ventricle. The aorta is measured by a transverse line drawn at its maximum width. The normal measurements in centimetres according to Vacquez and Bordet are as follows :—

TABLE

	Length	Transverse	Oblique	Left ventricle	Left auricle	Right ventricle	Right auricle	A. V. ratio	Bisector	Aorta
Maximum ..	15.0	14.5	10.5	8.5	5.0	14.7	6.5	0.704	2.0	5.7
Minimum ..	11.5	9.5	9.3	6.7	3.5	8.5	3.5	0.534	0.6	3.0
Mean ..	13.2	12.0	9.9	7.5	4.2	11.6	5.0	..	1.0	..

records of the heart shadow and helps to determine the relative sizes of its chambers. In conjunction with the clinical examination this makes for accuracy hitherto unknown in clinical medicine. Radiography and clinical medicine go forward together, the  $x$ -ray affording the illustration of living pathology to the deductions from a physical examination.

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The heart in epidemic dropsy.—Cardiac involvement is a common feature in epidemic dropsy. Chopra and Basu (1930) and Chopra

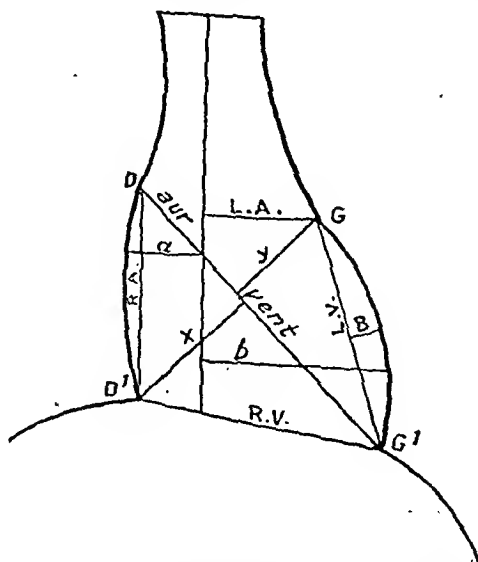


Fig. 1.—Teleradiographic measurements of a normal heart.

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## LEAVE

Lieutenant-Colonel P. F. Gow, Professor of Midwifery, Medical College, Calcutta, is granted leave for 3 months and 15 days, with effect from the 14th May, 1937, or from any subsequent date from which the leave is availed of.

Lieutenant-Colonel P. Bannerji, Officiating Superintendent, Campbell Medical School and Hospital, Calcutta, is granted leave for 7 months and 25 days, with effect from the 28th February, 1937, or any subsequent date.

Previous notifications are hereby cancelled.

Lieutenant-Colonel W. M. Will, Assistant Director-General, Indian Medical Service (Stores), is granted combined leave for 6 months and 27 days, with effect from the 23rd April, 1937, and subsequent date from which he may avail himself of it.

Lieutenant-Colonel J. Rodger, M.C., is granted leave on average pay for 7 months. Dated 31st March, 1937.

Major W. D. B. Read, Officiating Assistant Director, Central Research Institute, Kasauli, is granted leave on average pay for 4 months and 2 days ex-India, with effect from the 6th April, 1937, or any subsequent date on which he may avail himself of it.

## PROMOTIONS

*Majors to be Lieutenant-Colonels*

S. N. Makand. Dated 1st March, 1937.

A. C. Alagappan. Dated 3rd March, 1937.

B. R. Chaudhri. Dated 22nd March, 1937.

*Captains to be Majors*

W. J. Shipsey. Dated 1st October, 1936.

M. P. Conroy. Dated 3rd March, 1937.

*Lieutenants (on probation) to be Captains (on probation)*

S. C. Colbeck. Dated 10th January, 1937, with seniority from 1st September, 1936.

J. H. Bowie. Dated 9th January, 1937, with seniority from 1st September, 1936.

W. S. Ampey. Dated 9th January, 1937, with seniority from 1st September, 1936.

A. G. Miller. Dated 9th January, 1937, with seniority from 1st September, 1936.

E. H. Wallace. Dated 27th December, 1936.

J. F. Thomson. Dated 17th March, 1937.

The seniority of the undermentioned officers is antedated as follows:—

Lieutenant C. H. Bliss to 1st November, 1935.

Lieutenant W. A. H. Mitchell to 1st March, 1936.

Lieutenant R. B. Davis to 13th June, 1936.

## RETIREMENTS

Lieutenant-Colonel L. Blake, M.C., on account of ill health. Dated 3rd March, 1937.

Lieutenant-Colonel A. J. Lee. Dated 6th March, 1937.

## RELINQUISHMENT

Lieutenant (on probation) W. Laurie relinquishes his probationary appointment. Dated 29th January, 1937.

## Note

## DETTOL

IMPORTANT claims have been made for 'Dettol', an antiseptic which is widely used in England. These claims have been confirmed within the past year or two by articles which have appeared in the medical press by eminent medical men. It will be sufficient to mention here, Dr. Leonard Colebrooke of Queen Charlotte's Hospital, London, who has demonstrated that when 30 per cent 'Dettol' is applied to the skin and allowed

to dry it confers protection against infection by hæmolytic streptococci for a period of at least two hours afterwards. He has also stated that a 2 per cent solution of 'Dettol' was found to destroy hæmolytic streptococci and *B. coli*, even in the presence of pus, within two minutes. This and other findings are given in the *Journal of Obstetrics and Gynaecology of the British Empire* (Vol. XL, No. 6, October 1933). In a more recent paper in the same journal (Vol. XLIII, No. 4, August 1936), Dr. Colebrooke states that since the introduction of 'Dettol' into the hospital in 1933, the incidence of infection due to all grades of hæmolytic streptococci has been reduced by more than 50 per cent, when compared with a similar period immediately prior to the introduction of 'Dettol'. A significant mention is that since there has been no other change in antiseptic procedure the improvement can fairly be ascribed to 'Dettol'.

Briefly 'Dettol' is three times as efficient a germicide as pure carbolic acid when tested against *Bacillus typhosus* according to the Rideal-Walker method. It is non-poisonous, non-staining to linen and skin and is an excellent deodorant. Its combination of properties enables it to be used at really effective strengths on the skin and mucous membrane.

'Dettol' would appear to be an antiseptic which can be confidently relied upon for general surgery use, including skin sterilization and the treatment of major and minor wounds and burns, for obstetric and gynaecological purposes, and for general recommendation to patients.

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## Original Articles

## TELERÖNTGENOGRAPHY OF THE HEART IN EPIDEMIC DROPSY

By R. N. CHOPRA, C.R.E., M.A., M.D. (Cantab.),  
M.R.C.P. (Lond.)

BREVET-COLONEL, I.M.S.

Honorary Physician to H. M. the King-

R. N. CHAUDHURI, M.B. (Cal.)

and

P. C. SEN GUPTA, M.B. (Cal.)

(From the School of Tropical Medicine, Calcutta)

TELERÖNTGENOGRAPHY is a method first introduced by Köhler (1935) in 1904-1905 for obtaining an exact determination of the size and form of the heart, but it was hardly made use of until recent years. A great change has taken place in the attitude of the profession in this country towards this useful diagnostic measure. While a few years ago hardly anyone thought about it, clinicians now use it often as part of the routine examination in the different cardiac disorders. A teleradiogram furnishes accurate permanent

to the median line to the greatest convexity of the heart shadow to the right and to the left, indicates the transverse diameter of the heart, the sum of  $x$  and  $y$ , the lines drawn perpendicular from  $D^1$  and  $G$  to the line  $D G^1$ , is the oblique diameter.  $D D^1$  gives a measure of the right auricle, and  $G G^1$  that of the left ventricle; length of the line drawn perpendicular to the middle line from  $G$  gives the measure of the left auricle and  $D^1 G^1$  that of the right ventricle. To obtain the auriculo-ventricular ratio the line  $D G^1$  is divided into two segments by joining  $D^1 G$ ; the upper segment represents the auricle and the lower one the ventricle. The fraction obtained by dividing the length of the upper segment by that of the lower is called the auriculo-ventricular ratio. The other measurement is the bisector  $B$ , a perpendicular to  $G G^1$  at the greatest convexity of the left ventricle, which indicates the thickness of the wall of the left ventricle. The aorta is measured by a transverse line drawn at its maximum width. The normal measurements in centimetres according to Vacquez and Bordet are as follows:—

TABLE

	Length	Transverse	Oblique	Left ventricle	Left auricle	Right ventricle	Right auricle	A. V. ratio	Bisector	Aorta
Maximum ..	15.0	14.5	10.5	8.5	5.0	14.7	6.5	0.704	2.0	5.7
Minimum ..	11.5	9.5	9.3	6.7	3.5	8.5	3.5	0.534	0.6	3.0
Mean ..	13.2	12.0	9.9	7.5	4.2	11.6	5.0	..	1.0	..

records of the heart shadow and helps to determine the relative sizes of its chambers. In conjunction with the clinical examination this makes for accuracy hitherto unknown in clinical medicine. Radiography and clinical medicine go forward together, the x-ray affording the illustration of living pathology to the deductions from a physical examination.

## Normal measurements

Shorten (1937) recently described the method, based on the work of Vacquez and Bordet, as used in his own practice as well as in the Carmichael Hospital for Tropical Diseases. Measurements are carried out chiefly in the postero-anterior teleradiograms (figure 1). First the four points  $D$ ,  $D^1$ ,  $G$  and  $G^1$  are marked;  $D$  represents the junction of the right auricle with the superior vena cava;  $D^1$  is at the junction of the right ventricle with the diaphragm;  $G^1$  (the usual site of the cardiac apex) is the junction of the left border of the heart with the diaphragm; and  $G$  is the junction of the left auricle and left ventricle (the node of no motion on the screen). A vertical line is next drawn through the centre of the spines of the vertebrae; this is the median line. The line  $D G^1$  represents the length; the sum of  $a$  and  $b$ , the lines drawn at right angles

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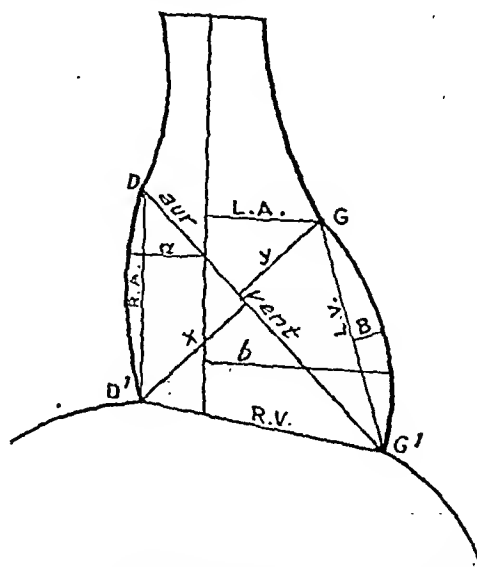


Fig. 1.—Teleradiographic measurements of a normal heart.

and Bose (1933) studied the clinical aspects of cardiac affection and described the subjective and objective manifestations in the patient. Chopra

and Chaudhuri (1935) described the symptomatology of 66 cases of epidemic dropsy in Purulia. Chopra, Chaudhuri and De (1937) reported the electrocardiographic changes based on a study of 50 such cases. During the last year or so, however, teleradiography, as a routine investigation

in epidemic dropsy cases admitted to the Carmichael Hospital for Tropical Diseases, has now been instituted. The following observations are based on a study of the teleradiograms of 60 cases of epidemic dropsy showing symptoms of cardiac failure in different degrees, that were

*Teleradiographic measurement of 60 cases of epidemic dropsy*

Serial number	Initials	Age	Sex	Aortic arch	Left auricle	Left ventricle	Right auricle	Right ventricle	Length	Transverse	Oblique	Bisector	A V. ratio
1	T. P. D.	25	M.	4.6	2.4	12.4	8.8	7.2	12.6	9.0	9.5	2.0	0.518
2	L. N.	20	M.	4.5	4.8	9.5	8.7	7.4	12.8	10.0	9.7	1.5	0.828
3	R. K. C.	16	M.	4.1	4.0	9.1	7.1	10.5	12.9	10.6	9.8	0.9	0.535
4	N. K. C.	11	M.	3.7	4.2	7.1	8.5	7.6	11.0	9.7	7.9	1.2	0.833
5	A. H.	14	M.	4.5	3.1	7.1	5.6	9.0	11.0	10.2	8.4	1.5	0.571
6	F. M.	16	M.	4.3	5.1	8.4	6.3	9.8	11.9	11.0	9.8	1.4	0.545
7	B. D.	26	M.	5.0	4.8	9.1	6.7	10.8	13.1	11.7	10.2	1.5	0.575
8	M. K. H.	26	M.	5.1	2.9	9.8	8.1	11.1	13.0	12.0	10.9	1.2	0.460
9	M. M. B.	28	M.	4.4	4.1	7.6	6.8	9.0	12.0	11.0	8.8	2.0	0.714
10	G. A. M.	25	M.	4.0	3.4	9.8	6.6	12.3	13.8	12.8	9.8	1.8	0.408
11	B. B. R.	32	M.	5.0	3.7	8.4	6.7	11.7	12.6	10.7	9.5	0.4	0.464
12	I. B. M.	28	M.	5.2	3.8	11.2	7.9	10.6	14.0	11.9	10.6	1.5	0.473
13	F.	40	F.	4.6	2.3	8.6	5.4	8.8	10.9	9.5	7.7	1.4	0.379
14	P. D.	13	F.	3.9	3.8	8.9	7.2	9.6	12.2	10.7	9.5	1.5	0.549
15	H. D.	21	F.	4.4	4.4	8.6	7.1	10.1	12.6	11.2	9.6	1.5	0.575
16	L. C.	45	F.	4.3	3.8	9.6	6.6	8.7	12.2	12.1	8.7	1.8	0.544
17	G. C. B.	33	M.	4.4	4.9	6.2	7.2	10.0	12.0	10.2	9.2	0.7	0.904
18	N. K. B.	35	M.	5.0	2.4	10.7	8.8	8.5	12.3	10.4	10.1	1.9	0.581
19	M. N. C.	28	M.	5.0	5.1	8.8	7.7	11.8	14.9	12.7	10.0	1.2	0.693
20	B. K. D.	33	M.	4.2	2.7	8.7	8.1	9.7	12.7	10.3	9.6	1.8	0.649
21	K. K. D.	45	F.	4.2	6.4	9.9	9.0	12.1	14.4	14.7	12.5	2.5	0.618
22	A. M. Z. I.	32	M.	4.2	3.8	9.2	7.9	7.5	11.2	9.9	9.6	1.7	0.647
23	L.	26	M.	4.9	4.7	8.6	8.3	10.8	13.4	11.8	10.0	1.3	0.634
24	K. P. S.	27	M.	5.2	5.3	8.7	9.2	7.7	13.2	8.6	10.0	1.7	0.72
25	S. L. B.	18	M.	4.6	3.2	9.8	8.0	7.7	11.8	9.5	9.7	1.8	0.638
26	B. N. M.	30	M.	5.5	3.0	10.3	7.3	10.4	13.1	12.0	10.1	1.7	0.455
27	D. K. B.	13	M.	4.3	3.5	9.5	8.2	7.4	11.7	8.9	9.6	1.4	0.77
28	G. B.	16	M.	4.8	4.9	8.7	6.9	11.4	12.9	11.1	9.9	0.8	0.517
29	B. B.	15	M.	4.2	2.8	12.0	7.1	11.1	13.4	11.0	10.3	1.0	0.288
30	B. P.	30	M.	5.8	4.4	9.4	7.9	9.6	13.3	12.3	10.5	1.7	0.707
31	A. G.	34	M.	4.5	4.2	8.7	7.6	9.7	12.9	11.1	9.7	1.2	0.653
32	M. B.	19	M.	4.0	4.1	8.6	8.0	7.5	12.1	9.7	9.3	1.6	0.861
33	S. S.	27	F.	4.1	4.8	7.2	7.3	8.5	12.1	9.3	8.6	0.7	0.890
34	A. M.	15	M.	4.5	4.6	8.1	7.4	9.1	11.9	10.7	9.4	1.5	0.652
35	B. P. D.	20	M.	4.5	5.7	9.5	7.7	11.0	13.9	11.8	11.0	1.4	0.634
36	M. M.	40	M.	4.5	5.5	10.0	6.4	11.9	13.6	12.5	10.6	1.4	0.446
37	S. N. G. C.	38	M.	5.5	3.9	9.4	8.2	13.0	14.4	13.5	10.9	1.1	0.548
38	A. R.	13	M.	4.3	4.3	7.1	6.1	7.9	10.3	9.6	8.4	1.5	0.660
39	S. K. C.	14	M.	4.6	3.5	9.7	6.8	8.0	11.8	9.6	8.6	1.7	0.573
40	A. S.	16	M.	4.0	5.3	7.6	5.3	9.5	11.0	9.8	9.0	1.1	0.527
41	B. M. C.	28	M.	5.1	3.3	8.5	7.8	8.7	11.6	10.0	10.0	1.6	0.657
42	N. B. D.	50	M.	5.0	5.3	11.1	8.3	12.4	15.6	12.4	11.8	1.9	0.544
43	Md. D.	25	M.	4.8	4.0	8.8	7.3	10.1	13.5	11.8	10.2	1.5	0.607
44	A. J.	16	M.	4.8	4.8	10.2	7.3	12.8	14.1	13.0	11.6	1.4	0.438
45	B. C. B.	29	M.	5.5	4.0	10.4	6.6	11.1	13.1	11.7	10.3	1.8	0.393
46	K. C. D.	10	M.	4.3	4.1	6.3	4.4	8.9	10.0	9.5	7.5	1.3	0.515
47	A. K. T.	22	M.	4.6	3.8	9.7	7.7	9.7	13.0	10.5	10.2	1.3	0.567
48	R. R. M.	39	M.	4.8	4.4	10.1	7.6	9.5	13.2	11.4	10.7	...	0.609
49	D.	25	M.	4.8	3.7	8.7	7.6	9.3	11.7	10.7	10.1	1.3	0.581
50	N. K. S.	46	M.	4.4	5.0	10.2	8.3	11.5	14.6	12.3	10.7	1.7	0.569
51	A.	40	F.	5.3	3.4	12.6	7.4	11.9	14.6	11.6	10.5	1.1	0.327
52	M. P. J.	62	M.	6.5	6.1	10.8	6.2	16.2	17.8	15.8	9.7	1.4	0.459
53	Mrs. P.	50	F.	5.7	4.8	11.5	7.4	11.8	15.1	12.4	10.9	1.4	0.451
54	J.	16	F.	4.7	4.1	7.3	7.7	8.8	11.5	10.3	9.3	1.0	0.854
55	S. N. D.	30	M.	4.3	3.8	10.0	7.4	10.0	13.2	10.2	9.4	1.9	0.5
56	Mrs. F.	46	F.	5.0	4.0	8.4	7.4	11.8	14.1	11.8	10.7	1.2	0.698
57	A. C.	25	M.	4.3	5.4	9.6	8.0	10.1	14.0	11.2	10.1	1.6	0.647
58	A. M.	39	M.	5.7	4.8	12.4	6.8	13.2	15.8	13.6	11.4	1.3	0.385
59	L. G.	35	M.	5.2	3.7	8.2	6.7	12.0	12.1	13.1	9.3	0.9	0.541
60	M. N.	35	M.	4.5	3.5	9.7	9.2	9.8	13.9	11.0	10.1	1.4	0.654

admitted during 1934-1936. These measurements were made by Lieut.-Colonel J. A. Shorten, I.M.S., Hony. Radiologist to the Carmichael Hospital for Tropical Diseases, Calcutta.

*Discussion.*—A comparison of the measurements of these teleradiograms with the standards

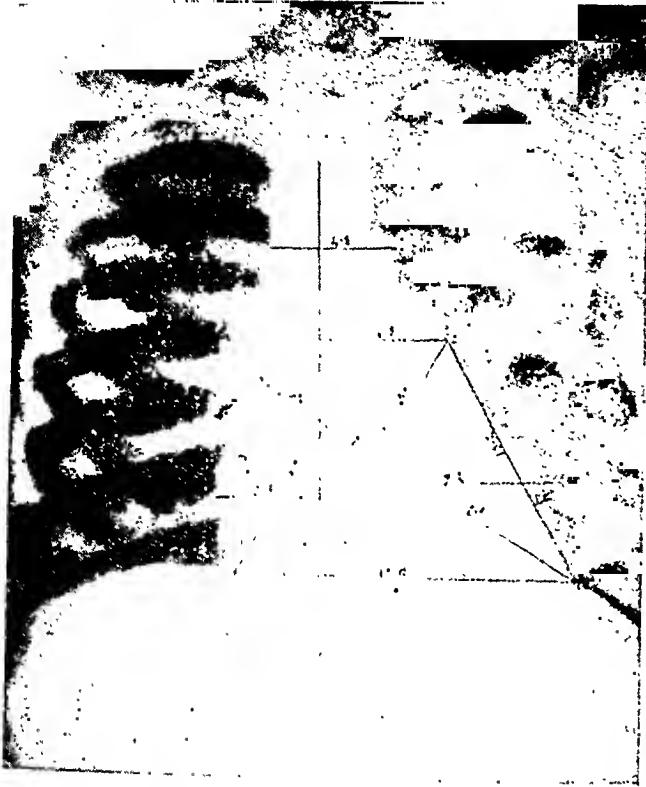


Fig. 2.—Teleradiographic measurements of the heart of a case of epidemic dropsy (no. 44 in table). Note the enlargement of the left ventricle and the right auricle, and the prominence of the pulmonary conus.

of Vaquez and Bordet shows that there are quite a number of variations from the normal as set forth by these authors. The most marked variation is in the measurement of the left ventricle and the right auricle. In 42 cases there is seen to be an increase in the measurements of both the left ventricle and right auricle. In two cases the left ventricle only is enlarged and in ten cases only the right auricle is enlarged. The measurement of the left auricle is increased in nine cases and that of the aortic arch and of the right ventricle in one case each only. In nineteen cases the auriculo-ventricular ratio is diminished below the normal limit—indicating an enlargement of the ventricles. In eleven cases the auriculo-ventricular ratio is increased above the normal limit indicating an enlargement of the auricles. The pulmonary conus was found prominent in a few cases.

From our clinical experience we find that the size of the heart is enlarged in a large majority of cases of epidemic dropsy. The enlargement is mainly outwards, sometimes downwards and outwards to the left. Sometimes there is an

enlargement of the heart to the right of the sternum. The upper border often reaches up to the second costal cartilage and a pulsation is seen in the second left interspace near the sternum. This is due to the dilatation of the pulmonary artery.

A mitral systolic murmur is a common finding in the epidemic dropsy heart. The regurgitant murmur at the apex is no doubt due to a dilatation of the heart and a consequent dilatation of the mitral ring causing an incompetence of the mitral valve. A systolic murmur over the pulmonary area is also a common feature. This murmur is not hamie in origin but is due to a dilatation of the pulmonary artery.

These clinical facts may be of help in the explanation of the teleradiographic findings in this series of cases. Besides, we know that there is a widespread dilatation of the cardiac capillaries. This leads to inefficient action of the heart. The left ventricle, which is required to do more work in maintaining the systemic circulation, dilates. This leads to congestion in the pulmonary circulation—and consequently of the right side of the heart.

The right auricle which is thin-walled dilates readily as a result of the back pressure. The measurements of the right ventricle and of the left auricle do not go beyond their wide normal limits in the postero-anterior teleradiogram unless there is a profound enlargement of these chambers. The comparatively lesser degree of enlargement are seen best in the oblique views, right ventricle in the right oblique and the left auricle in the left oblique with a 'barium swallow' at the time of taking the skiagram.

*Summary.*—A series of teleröntgenograms of 60 cases of epidemic dropsy, admitted into the hospital of the Calcutta School of Tropical Medicine, has been studied. The measurements of the left ventricle and the right auricle have been found to be increased in a large majority of cases (70 per cent). Alteration of the auriculo-ventricular ratio has been observed in 50 per cent of cases.

*Acknowledgments.*—Our thanks are due to Lieut.-Colonel J. A. Shorten, M.B., M.R.C.P. (Lond.), I.M.S. (Retd.), and Mr. E. H. W. Fleming, the radiographer who took the teleradiograms.

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## ENDEMIC FLUOROSIS IN THE NELLORE DISTRICT OF SOUTH INDIA

By H. E. SHORTT, M.D.

LIEUTENANT-COLONEL, I.M.S.

C. G. PANDIT, M.B., B.S., Ph.D., D.P.H., D.T.M.

and

RAO SAHIB T. N. S. RAGHAVACHARI, B.A.

(From the King Institute of Preventive Medicine, Guindy)

ABOUT the month of April 1936 the district health officer, Nellore, Dr. Lakshminarayana, had his attention drawn by the health inspectors of Podili and Darsi ranges of the Nellore district to a disease characterized by a definite train of symptoms and which was very prevalent in the district. The most obvious symptoms of this disease were stiffness and pain in the spinal region and in various joints. Cattle were stated to be similarly affected. In August 1936, the district health officer drew the attention of the Director of Public Health, Madras, to the existence of this disease and suggested that an investigation unit should be despatched from the King Institute, Guindy, to study the disease on the spot. In September the district health officer received an account from Dr. Holsted, of the American Baptist Mission, of the same disease, as observed by him in the village of Bommireddipalli.

As is usual in all parts of India, when a disease is not of known origin, this disease was attributed by the local inhabitants to the drinking water—in this case, as will later be apparent, with good reason. All these reports on the disease were considered to be sufficiently circumstantial to warrant the despatch of an investigation unit from the King Institute, but it was considered advisable, in the first case, to bring a few of the affected cases into hospital for a more thorough investigation than could be conducted in the field.

At this stage of the investigation one of us (C. G. P.) in the ordinary course of reading came across two short reviews describing a condition found in cryolite workers in Denmark due to chronic fluorine poisoning (Roholm, 1936). The symptoms described closely resembled those present among the patients in the district which was the subject of our investigation. The clue thus obtained as to the probable cause of the so-called 'mystery disease' in the Nellore district pointed the more obviously to fluorine in drinking water since this district contains well-known mica mines, a mineral often found associated with deposits containing fluorine compounds.

A small investigation unit under Mr. Raghavachari was despatched immediately from the King Institute to carry out a preliminary survey of the drinking water sources in the district, as regards fluorine content. This investigation at

once revealed the presence of fluorine, in some cases in large amounts, in the drinking water of the district and a heavy incidence of mottled enamel, the common early sign of fluorine poisoning, in the teeth of school children, thus confirming the conclusions already arrived at, on theoretical grounds, as to the probable cause of the disease. The widespread nature of the condition now revealed made it evident that the whole question of the prevalence and prevention of chronic fluorine poisoning, in at least the Nellore district and probably in other surrounding, or even distant, areas, had become a matter of urgent public health importance demanding a thorough investigation. Consequently, a second unit consisting of the Director, King Institute, and Mr. Raghavachari visited the area and was joined by the district health officer. The ground previously covered, as well as much new ground, was visited and arrangements were made for the obtaining of water samples from a very wide area covering the major portion of the Nellore district. As it was necessary that more detailed examination of affected cases should be made under hospital conditions allowing of full clinical, biochemical, and radiological investigations, a certain number of sufferers from the disease was transported to the General Hospital, Madras, in consultation with the Superintendent, Lieut.-Colonel G. R. McRobert, I.M.S. The investigation of these cases will form the subject of another report. As the preparation of this report and a full investigation of the water problem will take some time, a short summary is given below of the salient points in the investigation which have emerged up to date.

### *Chief clinical symptoms in persons affected by the disease*

*Early effects.*—These are exhibited in the children and take the form of a chocolate-coloured mottling or banding of the teeth. This effect, however, may be replaced by a dull but pure chalky-white appearance in the same situations. No other effects are noticeable in children. These early manifestations of the disease are present in over 50 per cent of school children in the several villages so far examined. In spite of the high incidence of this condition, none of the accounts of the disease received from the district made any mention of it. Had this symptom been noticed and reported, it is likely that the cause of the disease might sooner have come to light, as this is the symptom of fluorine poisoning most commonly reported in the literature.

*Later effects.*—Adults of thirty years and upwards, of both sexes, complain of pain in the spinal column, especially in the cervical and lumbosacral regions, and some stiffness and pain in the joints of both upper and lower extremities; there is usually anorexia. These symptoms are not yet sufficiently severe to prevent

the doing of light manual labour and the sufferers are still fairly well nourished.

*Final condition.*—The final stages in the condition are generally evident in people past forty and may be summarized shortly as follows :—

(a) Complete rigidity of the spine including the cervical region so that the affected person to turn his head must turn the whole body.

(b) Rigidity of the joints of both upper and lower limbs with inability to assume the squatting position.

(c) Fixation of the thoracic walls so that breathing becomes entirely diaphragmatic, while the chest is often barrel-shaped in an antero-posterior view but flattened in front.

(d) Symptoms of pressure on the spine may be present without actual spinal deformity.

(e) The patient is eventually completely bed-ridden and usually dies of some inter-current infection.

#### *Physiography of the district*

The district of Nellore lies to the north of Madras and comprises the area lying between the coast and the Velikonda hills. The width varies between 20 and 60 miles and the north-south extension is about 180 miles. The western border of the district includes outlying parts of the Velikonda hills but no part of the area is any considerable height above mean sea level. The coastal area is composed of low-lying sedimentary deposits including laterite. Apart from the coastal area the rest of the district forms a gentle slope upwards towards the Velikonda hills with detached hills or small ranges rising out of the plain. The district is traversed by several rivers in a general west-east direction, but these are not true perennial streams and have no surface flow for 10 months in the year. The only river of considerable size is the Pennar river which enters the sea at Nellore, the headquarters town of the district. Throughout the length of the coast line, and parallel with it, runs the Buckingham canal.

#### *Geology of the district*

The district dealt with in this report, i.e., the more northern part of the Nellore district, may be said to be composed of three zones parallel to the coast. The coastal or eastern zone consists of marine and fluviatile alluvia, the central zone of sedimentary rocks, and the western zone of crystalline gneissic rocks. The central zone contains rocks of two ages, schistose and granitoid gneisses. Most of the affected districts so far examined fall within the area of granitoid gneisses.

Over sixty specimens of rocks, taken from well-diggings, river and tank beds and mines and mine areas, were examined by us for the

presence of fluorides and in nineteen specimens fluorides were found to be present. These specimens are at present being examined by the Geological Survey of India with a view to their identification as minerals.

#### *Water supplies of the district*

The chief sources of drinking water throughout the district are shallow wells. Water is often found at a depth of about twelve to fifteen feet from the surface and the wells are dug to about ten feet below this level. Occasionally, the water may lie at a distance of 30 feet below the surface. The mounds of earth dug out of the wells are a characteristic feature of the generally flat landscape.

As a general rule, no effort is made to conserve the water supplies and the majority of the wells take the form of step wells.

It has already been stated that most of the waters examined in the affected districts showed a considerable proportion of fluorine and the further observation emerged from the examinations that, as a general rule, the degree to which the population of a village was affected by the disease was in direct proportion to the fluorine content of the water supply. In one case two wells, separated by not more than 150 yards, contained very different amounts of fluorine, which was found to be correlated with corresponding marked differences in the degree of involvement of the two villages using them as regards the incidence of symptoms of chronic fluorine poisoning. Our preliminary field tests for fluorine have shown amounts varying from 0 to 10 parts per million.

The villagers themselves, correctly attributing the disease to drinking water, had in many cases migrated from site to site in the search for better water, and their empirical choice of one well as against another was usually found to be justified by a lower fluorine content. As the fluorine gives no evidence of its presence in taste or smell this correct selection of the best available wells was difficult to account for until we found that high fluorine content often went with high total solids.

#### *Extent of the problem*

Although the investigation of the problem has not at present been carried beyond the Nellore district and its immediate surroundings, we have certain indications which point to the fact that probably a larger area is affected and, possibly, now that the subject has been raised, the condition may be found in other parts of India. In any case, now that the cause of so widespread a condition of disability has been discovered the public-health department of the Government of Madras will, we have no doubt, take the necessary measures to bring relief to the people of the district.

### *Solutions to the problem*

The recognition of chronic fluorine poisoning in Nellore district is of such recent occurrence that its prevention on a large scale can, as yet, be considered only on theoretical grounds.

The filtration of fluorine out of the water, while perfectly feasible as a laboratory measure, would probably be too costly for practical application in the field.

A second line of prevention might be the provision of water supplies from a greater depth in the hope that these might be free from fluorine. This would depend mainly on the geological factors concerned but is a line of research worthy of trial as it would be a simple solution. We have already arranged with the district authorities in Nellore for some experimental bores in the affected area.

### *Summary*

1. This account records the discovery of an area in Madras Presidency showing a high incidence of chronic fluorine poisoning.

2. This condition has been given the title of 'endemic fluorosis' because, so far as we know, in no previous description has the disease been so directly attributable to naturally-existing surface, or near-surface, water supplies, so severe in its manifestations in later life, as distinct from its effects on the teeth of children, and on so large a scale.

3. The clinical symptoms of the condition, and the geology and physiography of the district are briefly dealt with.

### *Acknowledgments*

We have to acknowledge the important part played in this preliminary investigation by Dr. T. Lakshminarayana, district health officer, Nellore, for bringing to our notice the existence of the 'mystery disease' and for very great help in carrying out the field investigations. To Mr. K. Venkatramanan, M.Sc., of the King Institute, we are indebted for very numerous chemical and other tests involved in determining the presence of fluorine in both water and minerals.

Dr. K. V. Gopalakrishnan, civil assistant surgeon, Ongole, was of great help to us in arranging the moving of patients, some of them bed-ridden, under difficult conditions of transport, and Dr. Holsted, of the American Baptist Mission, helped us greatly in the examination of children at various villages.

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## THE EFFECTS OF THE INJECTIONS OF MILK PREPARATIONS IN LEPROSY\*

By SARASI LAL SARKAR

and

BENI MADHAB BHATTACHARYA

*Raj Kumari Leper Asylum, Deoghar*

At the request of one of us (S. L. S.) Bengal Immunity Company and Bengal Chemical and Pharmaceutical Works, Limited, sent a quantity of their milk preparations and vaccines (combined strepto- and staphylococcal) for trial in the Raj Kumari Leper Asylum, Deoghar.

In leprosy cases complicated with the presence of ulcer and eczema, injections of vaccines and milk preparations were given a trial.

In some of the ulcerative cases, injections of vaccines appeared to be beneficial and to promote the healing process. Regarding the injections of leprosy nodules ground up with sand, sterilized and standardized, Dr. Muir has remarked in his book on leprosy: 'Much benefit up to a certain point is often derived from these injections..... There is no reason to believe that there is any specific action in any of these remedies; rather it would appear that protein shock is caused and that this has a remedial effect on leprosy. Not dissimilar is the effect of various fevers (such as malaria, kala-azar, typhoid, smallpox, etc.) in "B" cases (modern "C" cases) during the course of which diseases marked improvement in leprosy conditions may occur'.

The same thing may be said of the injections of staphylo- and streptococcal vaccines. Some benefit is derived in the beginning, but this is only temporary. Some of the ulcers are healed up, but are very liable to break out again. In such cases we found the injections of milk preparations useful. Better results are obtained if these injections are combined with the course of vaccines. When the vaccines produce no further improvement, the healing process will be stimulated again as the milk injections are started. Some hospital patients insisted upon getting injections of milk preparations to prevent the relapse of the ulcers, after they have been healed up by vaccine injections. What has been said about ulcers, holds good about the cases in which eczema is present as an associated condition.

*Comment.*—The ulcerated conditions in leprosy are to a certain extent due to trophic disturbance. The ulcers are apt to heal up and break out according as the nerve trunks which carry their trophic fibres have any disturbance, such as neural pressure arising from an inflammatory condition in the nerve itself or in its neighbourhood. Injections of milk preparations appear to relieve congestions and thereby the neural pressure. As will be seen from the case notes given below, some of the ulcer cases and

\* Rearranged by the Editor.

one of eczema case healed up by the injections of vaccine.

Antonis Aleixo, in a paper on the subject of lymphangitis in leprosy in *Brasil Medico* (February 1930), has expressed his opinion that hitherto little attention has been paid to the lymphatic changes in leprosy. Of 56 patients examined by him, 13 had lymphangitis—10 of these were of mixed form, and 3 of the nerve type. Excision showed that the swellings consisted of nodules along the lymphatic cords.

Chronic swellings often present in the lower extremities and sometimes also in the upper extremities were found to subside in some of the patients who had injections of milk preparations. This is possibly due to a certain extent to the subsidence of the inflammatory condition of the lymphatics.

given intravenously, 'relieves joint and bone pains'. The pain of this nature is often relieved by injections of milk preparations. But they do not relieve the pains of leprosy due to nerve lesions.

Before using milk preparations we tried the strepto- and staphylococcal vaccines for the treatment of eczema and ulcers present in leprosy patients. In these cases the routine treatment by injection of hydnocarpus oil with creosote was withheld. The injections of vaccine or milk preparations were given twice a week.

In the cases treated with vaccines only, we noticed improvement up to a certain point only. As has been stated above, subsequent injections of milk preparations improved greatly the condition of the patients and remedied the above defects. This is being shown in a tabular form in the following three cases :—

TABLE I

Number	Patient	Principal symptoms	Clinical history	Injections	Results
1	L. D., male, 48 years.	Ulcers	Duration 3 years. An advanced N <sub>2</sub> C <sub>2</sub> case. Extensive anaesthesia. Depressed nose. Some fingers contracted and some lost. Burning sensation in hands and limbs.	Nine injections of vaccines given from 30th January to 6th February, 1936, and again from 25th May to 18th June.	Ulcers temporarily healed up and broke out again when injections were stopped on two different occasions.
2	H. S., male, 48 years.	Extensive weeping eczema.	Duration 7 years. Extensive weeping eczema on forearms and legs. C <sub>2</sub> N <sub>2</sub> type with extensive anaesthesia in both extremities. Crooked fingers and toes and a few leprous infiltrations on face. Legs oedematous. Rheumatoid pains in joints and extremities.	Twenty-nine injections of vaccines from 30th January to 11th May, 1936. Then injections of lactamine 2 to 5 c.cm. each 14 times from 14th May to 25th June. Then 49 injections of lacto-protein 2 to 5 c.cm. from 25th June, 1936, to 19th February, 1937.	Vaccines caused some improvement. With milk injections eczema was remarkably cured. The oedema and rheumatic pains also disappeared.
3	N. R., male, 35 years.	Ulcers	Duration 5 years. N <sub>2</sub> case with depigmented anaesthetic patches distributed all over the body. Cracks in both legs. Trophic ulcers on the soles of both feet. Joint pains and burning sensations in hands, specially at night. Also hook-worm infection.	Vaccines 0.5 to 1 c.cm. Five injections from 27th April to 11th May, 1936. Then 48 injections of lacto-protein in 2 to 10 c.cm. doses from 14th May, 1936, to 19th February, 1937.	Ulcers healed up. Joint pains and burning sensations were much relieved.

While the injections of milk preparations were being used for the treatment of leprotic ulcers and associated eczema, it came to our notice that these injections exert a beneficial effect on a certain kind of pain complained of by leper patients. Muir states, 'Sodium salicylate, four grains dissolved in 5 c.cm. of normal saline and

From the observations of the cases like these, we found out that injections of milk preparations act beneficially in rheumatic pains of the joints and limbs. We used lactoprotein extensively for the purpose. In a few cases, the injections were found to relieve the oedematous condition of the extremities and to improve the general

health of the patient. They also cured the ulcers and eczema, though no vaccine was used.

The following cases illustrate the fact :—

### Summary

1. The injection of milk preparations improves the general health of cases of 'C' type of long duration.

TABLE II

Number	Patient	Principal symptoms	Clinical history	Injections of lacto-protein	Results
1	M., male, 16 years.	Eczema	Duration 5 years. Some eczema present in both legs. An advanced $C_2N_2$ case. Thick ear lobes, leprous infiltration all over the body, extensive anaesthesia of lower extremities and dorsum of hand. He is having no improvement with routine treatment.	Five injections of 2 to 5 c.cm. from 6th to 27th August, 1936.	There was improvement of general health and eczematous condition.
2	A. M., male, 20 years.	Rheumatic pain and oedematous condition.	Duration 10 years. $C_2N_2$ case with extensive leprous infiltration on face and a few present on the body. Face swollen with shining skin. Anaesthesia in the lower extremities which are also swollen. Occasional rheumatic pain present.	Twelve injections of 5 c.cm. each from 12th January to 19th February, 1937.	Oedematous condition of the legs and feet almost disappeared. Rheumatic pain better.
3	S., male, 25 years.	Rheumatic pain, oedema of the extremities and ulcers.	Duration 12 years. Has both syphilitic and hookworm infections. Advanced $C_2N_2$ case with leprous infiltration all over the body. Ear lobes and nose thickened. Body much emaciated. Palate perforated. Several ulcers on the fingers with marked unhealthy granulation. Rheumatic pains present in the joints.	Eleven injections of 5 c.cm. each from 12th January to 19th February, 1937.	General health improved; oedema subsided, ulcers much improved.
4	D., male, 45 years.	Rheumatic pain.	Duration 5 years. $N_2$ case with foot drop, anaesthesia and occasional pain on the dorsum of the left foot.	Nine injections of 5 c.cm. each from 12th January to 12th February, 1937.	Less pain in the left foot.
5	B., female, 41 years.	Rheumatic pain.	Duration 11 years. Has syphilitic infection. $C_2N_2$ case. <i>Facies leontiasis</i> present. Partial anaesthesia of hands and feet. Wrinkling of skin. Rheumatic pains all over the body.	Eleven injections of 5 c.cm. each from 12th January to 19th February, 1937.	Intensity of pain diminished.

There was little or no improvement in a series of four cases, in spite of the injections of milk preparations (see table III).

2. It heals up associated eczema and some varieties of leprotic ulcers.
3. It diminishes the oedematous condition due to chronic inflammatory congestion.

TABLE III

*Cases with no marked benefit after the injection of the milk preparations*

Number	Patient	Principal symptoms	Clinical history	Injections	Results
1	A., female, 48 years.	Nerve pain	Duration 15 years. Type N <sub>2</sub> , extensive anaesthesia of both upper and lower extremities. Marked contractions of fingers of both hands with wasting of inter-ossi muscles producing <i>main en griffe</i> . Frequent nerve pains. Some of the nerves thickened.	Eleven injections of lactoprotein from 12th January to 19th February, 1937.	No diminution of pain.
2	R., male, 50 years.	Nerve pain	Duration 14 years. N <sub>2</sub> type. Extensive anaesthesia of both upper and lower extremities together with numerous depigmented anaesthetic patches scattered over the body. Occasional attacks of nerve pain. Some of the nerves little thickened. Burning sensation in hands and feet. Hookworm infection.	Twelve injections of lactoprotein from 12th January to 19th February, 1937.	Some diminution of burning sensation. No diminution of pain.
3	T., 48 years.	Nerve pain and ulcers.	Duration 1 year. N <sub>2</sub> type. Anaesthesia of hands and feet. Depigmented anaesthetic patches of various sizes found all over the body. Contraction of left hand and general wasting of muscles. One anaesthetic patch on thigh and some macules and ulcers.	Twelve injections of lactoprotein from 12th January to 19th February, 1937.	The ulcers gradually healed up, but there was no diminution of nerve pain.
4	G.S., male, 30 years.	Arthritis and pain in both knee joints.	Duration 14 years. N <sub>1</sub> C <sub>2</sub> case. He had leprous infiltration all over the body. He appeared to be slowly improving under the general routine treatment when he suddenly got acute inflammation of both the knee joints, which made him bed-ridden.	At first six vaccine (strepto-staphylo) injections of 0.5 to 2 c.cm. given. Then one injection of lactamine 5 c.cm. on 20th February, 1936. Then 56 injections of caseinol given from 24th February to 17th September. These had no effect on arthritis. Subsequently he was given 20 tabloids of atophan and arthritin injections.	Strepto- and staphylococcal vaccines and caseinol had no effect. Arthritin acted very well in this case.

4. It relieves rheumatic pains in the joints and limbs frequently met with in 'C' type of leprosy.

5. The 'N' type of case does not appear to be appreciably benefited by these injections and nerve pains are not relieved.

6. In several instances of leprosy the injections of milk preparations help the beneficial actions of vaccines.

[Note.—Perhaps a little more emphasis should have been laid on the fact that in the acuter forms and phases of leprosy, protein shock, either by milk injections or by other means, is definitely contra-indicated.—EDITOR, I. M. G.]





## RESULTS OF SPLENECTOMY FOR TROPICAL SPLENOMEGALY

### AN ANALYSIS OF THIRTY-THREE CASES

By A. N. PALIT, O.B.E., F.R.C.S. (Edin.)  
LIEUTENANT-COLONEL, I.M.S.

*Civil Surgeon, Gaya*

DURING the three years 1933 to 1935 I have operated on thirty-three cases of splenomegaly at the Cuttack General Hospital and an analysis of these cases will probably be found interesting.

(Continued from previous page)

of 0.5 c.cm. and that in future the only justification for the use of 0.5 c.cm. doses would be the non-availability of sufficient material to permit the use of 1 c.cm. doses.

#### *The rate of development of immunity*

The desirability of determining the rate of development of immunity in man is obvious, but even from a large number of observations it seems impossible to do so with any real degree of accuracy. It is true that the average incubation period of cholera is very short, but in cases it can extend to several days, the impossibility of ascertaining the date of commencement of incubation upsets all efforts at accurate determination of the time factor in development of immunity after inoculation. We have studied this question from the statistics at our disposal; a table is given dealing with 146,536 people—children below the age of four have been excluded—who were inoculated in villages, which were infected with cholera.

From these figures it appears reasonable to infer that immunity is developed with 0.5 c.cm. doses fourteen days after inoculation and with 1 c.cm. doses seven days after inoculation.

The following table is of interest from a practical point of view, as it shows that at the termination of mass inoculation with 0.5 c.cm. doses over extensive areas the practical cessation of the disease may be confidently anticipated within fourteen days:—

Tehsil	Percentage of population inoculated	Cases before termination of mass inoculation	Cases within 14 days of termination of mass inoculation	Cases 14 days or more after the termination of mass inoculation
Kulgam ..	83	1,135	78	11
Badgam ..	73	2,248	306	11
Anantnag	74	1,261	389	70

The causes of such splenomegaly so far as could be determined were mostly either malaria or splenic anæmia, sometimes the latter supervening on the former. The proportion of malarial cases to that of splenic anæmia was roughly two to one in my series.

The size and weight of the biggest spleens removed were as follows:—

Size in inches	Weight
13 by 8 by 3½	.. 7 lb. 12 oz.
14 by 5 by 2	.. 5 lb. 8 oz.
11 by 6½ by 3	.. 7 lb.
12½ by 10 by 8	.. 5 lb. 12 oz.

The last one was a case of intracapsular rupture, the capsule forming a big cyst and filling up most of the abdomen.

The photographs illustrate the enormous size of the spleens as compared with the anatomical specimen in the middle; the spleens had got considerably hardened and shrunk in the pathological museum. The small spleen is a papier mâché model of a normal organ from the anatomy museum.

The three smallest spleens removed from children weighed and measured as follows:—

Age of child	Size of spleen in inches	Weight
11 years	.. 9 by 6 by 3	2 lb. 3 oz.
12 "	.. 6½ by 4½ by 2½	2 lb. 4 oz.
14 "	.. 8 by 4½ by 4	2 lb. 3½ oz.

In every instance the weight and measurements were taken after the blood had drained away, so before removal the spleens must have been considerably bigger and heavier.

The age of the patients varied from 45 to 11 years, the average age being about 30.

The liver in almost every case is considerably enlarged; some are simply enlarged; thirteen showed hobnailing of which three were very badly hobnailed and fissured, two were hobnailed and contracted and many showed a reticulated appearance on the surface; I take it as the first stage in hobnailing. Many of the cases were jaundiced; this often cleared up under medical treatment.

*Ascites.*—Three patients had marked ascites. Ascites has been mentioned by various authorities as a contra-indication to operation and for the first two years or so I refused to operate on such cases. But my boldness and confidence with increasing experience seem to have been justified.

The duration of the splenic enlargement varied from 12 years to 3 months, the latter being obviously a case of splenic anæmia. The average duration of malarial enlargement was 5 to 6 years.

*Deaths.*—Two of my cases died, both on the day of operation from hæmorrhage. There has been no death amongst the last sixteen cases operated on. In both the fatal cases the

spleen was very firmly adherent to the diaphragm and to stop hæmorrhage from a denuded raw diaphragm is one of the most difficult feats of surgery.

In only one case had the abdomen to be closed without removing the spleen—in this case the parietal peritoneum was firmly adherent to the spleen, just as one sees in rare cases of enormous ovarian cysts.

In one case operated on recently the spleen was firmly adherent to the overlapping liver and had to be torn away. Had I discovered this earlier I would have left it alone. The liver bled profusely. The patient luckily survived; the hæmorrhage was controlled with very hot sponges and stitching the omentum to the raw liver edge.

*Class of cases selected for operation.*—The run on the hospital for splenectomy had been phenomenal, especially during the last year and a half. The hospital steward tells me that from his village alone there have been eight splenectomy patients. Of the cases seeking admission only about 50 per cent can be admitted as the wards are always full and of these again only a small percentage had been operated on. In some, the spleen reduces in size to an appreciable extent and the patients are discharged after medical treatment. Others are discharged as unsuitable for operation, *e.g.*, those with Wassermann reaction positive with marked ascites and jaundice, with persistent anæmia not responding in the slightest degree to treatment, with albumin and casts in the urine, and with bruits or jugular pulsation, etc. However, two cases with marked ascites, jaundice and hæmic murmurs were operated on, recovered, and fully justified the risk taken.

Cases selected for operation were those whose general condition and blood picture improved after medical treatment, yet the spleen being hard and fibrosed would not reduce in size by more than a couple of inches.

The rough and ready rule I generally follow is not to operate on a patient unless the lower border of the spleen after treatment is below the level of the umbilicus.

#### *Reasons for operating*

Patients with an enormously enlarged, functionless but very vascular organ occupying a large proportion of the space inside the abdomen are in continual ill health, and, beyond a certain point, no medicinal treatment can improve their general condition. The anæmia which is often severe with a red cell count of 3,000,000 per c.mm. or less does not improve beyond an increase of half a million or so even after massive doses of iron, arsenic, liver, etc. The patient is often incapacitated and cannot earn a living, thereby becoming a burden on his family, while leading a miserable existence till some intercurrent disease, or ascites and cirrhosis of the liver carry him off. I am

convinced that at least some of the cases of ascites one sees are due to splenic enlargement.

After operation in spite of no other treatment, except quinine and perhaps atebirin in malarial cases, the patient rapidly regains health, the red cell count goes up to about 5,000,000 per c.mm. and in a few cases have gone up to 5,900,000 per c.mm. The only drawback is that in some cases the patient develops a resistant type of malarial fever after the operation which lasts a fortnight or so but gradually comes under control, and, once cured, they do not seem to have relapses unless they go back to a malarial environment and then they are no worse off than their neighbours. In one case—a girl of 14—the fever lasted six weeks.

The liver is enlarged enormously in splenomegaly, varying from two finger-breadths below the costal arch to eight. No amount of medical treatment makes any impression on the size of the liver. Removal of the spleen effects a rapid diminution in the size of the organ, presumably (at least partly) by the stoppage of enormous quantity of blood from the spleen passing up the portal veins into the liver.

The liver, which is very often found to be in the process of undergoing cirrhosis, as seen by various stages of hobnailing and fissuring, improves after splenectomy, as was definitely proved in at least one man who died a year or so later from acute ptomaine poisoning. Whereas, if not operated on, I am sure the liver gets more and more cirrhotic.

Persons with enlarged spleen are very liable to rupture of the organ from a slight blow or a fall. My first case of splenectomy was for intracapsular rupture due to the abdomen having been massaged to reduce the size of the tumour as the patient described it. Cases of death from ruptured spleen are very common in the tropics and these cases seldom come to hospital in time for operation.

Lastly, for splenic anæmia, Banti's syndrome, there is no known cure except splenectomy, although Stanley Davidson emphatically states that he has had excellent results from massive doses of iron. Our results had been disappointing in this respect. He further states that there is little to recommend splenectomy apart from possible relief of portal congestion and 50 per cent of cases continue to get gastric hæmorrhage. Our results have been entirely different, though I must admit that enough time had not elapsed to show that there had been no return of the symptoms.

Walton reports a case in which, after splenectomy for malarial enlargement, the patient had a sharp rise of temperature; this phenomenon has been fairly common in my cases, about 40 per cent of which showed benign tertian or malignant tertian rings in the blood. The fever rapidly subsides after quinine treatment though, as mentioned above, a few cases take

longer to come under control. The chief dangers and precautions to be observed are:

(1) The incision must be adequate—I always make the para-median incision. In one case only had I to enlarge the field by making a horizontal one as well, i.e., shaped T—.

(2) Injuries to or rupture of veins—big sausage-like veins are very liable to rupture.

and that he would not live more than a couple of years or so. The operation was performed on 2nd February, 1935.

The spleen weighed four pounds—very big for a small boy of 12—and measured 9 by 6 by 2½ inches. There were a lot of adhesions. Pancreas was rather hard and adherent to the spleen and gave some trouble. Liver was enlarged four finger-breadths below the costal arch and was distinctly hobnailed.

The blood counts were as follows:—

Date	..	..	..	12th October, 1934
Red blood cells per c.mm.	..			2,880,000
White blood cells per c.mm.	..			4,375
Hæmoglobin per cent	..			45
Polymorphonuclears per cent	..			55
Lymphocytes per cent	..			34

27th February,  
i.e., 25 days  
after operation.  
4,560,000  
5,625  
80  
57  
28

17th March

4,600,000  
12,500  
80  
54  
28

18th April

5,200,000  
5,600  
85  
not done  
..

(3) Slipping ligature—it is always advisable to put two or more ligatures on the main vessels. It is not possible in most cases to tie the artery and veins separately, as any attempt to separate these structures causes furious bleeding. The only remedy is to put two or three ligatures. Unless thick material is used the ligature may cut through the thin friable venous walls.

(4) Tearing the fragile spleen—I have never met with this accident.

(5) Inclusion of some other structures, such as the pancreas, in the ligature—one has to be very careful to avoid this accident.

It is stated by most observers that the majority of deaths are due to progressive thrombosis of the splenic pedicle; this has not been observed in either of my two fatal cases.

In conclusion it may not be out of place to quote Thorek's advice 'Think twice before you operate' (I think oftener before I undertake to do a splenectomy). 'While splenectomy is a comparatively simple procedure in the hands of the experienced, it may prove fatal in the hands of the novice. If one has not assisted in the removal of several spleens or acquired sufficient skill to remove one successfully, one should not undertake the operation unless aided by an experienced fellow surgeon. If he does, his own splenomegaly may lead him into trouble'.

I have given abridged accounts of some of the more typical cases with a few photographs of the removed spleens.

Case 1.—G. M., Hindu male, aged 12, was admitted on 11th September, 1934, for an enormously enlarged spleen reaching right down into the pelvis and filling the greater part of the right side of the abdomen as well. He was very emaciated, the limbs were just skin and bone. He could hardly walk. The legs were oedematous, and there was a history of black tarry stools. He was not considered fit for operation but we wanted to see how much could be done by medical treatment. Quinine, iron, arsenic, copper, cod-liver oil, liver, milk-injections, etc., were all tried. His condition improved only a little.

The usual tests for malaria, kala-azar, ankylostoma, syphilis, etc., were negative. After a few months in hospital though the boy looked only slightly better than he was before I decided to risk an operation as I considered that, so long as that enormously enlarged spleen remained, the patient's life would be a burden

The patient, being asked to report three months later, came to hospital on 8th July, 1935—the red cell count was 4,400,000 and hæmoglobin was 75 per cent but he was quite healthy, though he did not look so



Fig. 1.

well fed as he was in hospital, which is only natural. The diagnosis was splenic anaemia, supervening on a malarial enlargement of the spleen. The patient gave a history of petechial hæmorrhage and melæna—he never had these while in hospital but had spongy bleeding gums on admission. Since discharge he had no melæna. The liver was almost normal in size when he came back for re-examination.

Case 2.—M. N., Hindu male, aged 30, was admitted on 26th March, 1934, for enlarged spleen and ascites with marked oedema of legs. He gave a history of fever and rigors since childhood. The spleen became quite big eight years previously. He could not say when he started to get ascites but it had been bad for the last two years. He had marked jaundice, precordial pain, systolic bruit in the mitral area conducted towards the axilla, cough and spongy gums. Had heavy ankylostoma infection. Operation was refused but the patient declined to leave hospital. In the meantime, he had an attack of colitis and was transferred to the infectious hospital, where no positive finding was reported. He was transferred back to the surgical ward after several months and at the request of my assistant surgeons and earnest desire of the patient I consented to operate. He was operated on on 18th September. Spleen weighed five pounds and measured 14 by 5 by 2 inches.

The liver was enlarged three finger-breadths below the costal arch but was not hobnailed. The patient made an uninterrupted recovery, the ascites never reappeared, jaundice cleared up and so did oedema of the legs. He recovered his health so quickly that he was discharged on 23rd October. This patient was one of the most interesting cases of my series. Red cell count went up from 3,000,000 per c.mm. to 4,500,000 per c.mm. The patient came to report himself in July 1935. There was no return of ascites but he said he had a recent attack of malaria for which he was kept in a hospital and treated. The fact that ascites had not reappeared opens up an interesting field for research. Ascites has been stated by various authorities as a contra-indication for operation and yet in this case the patient did so well.

*Case 3.*—U., Hindu female, aged 15, was admitted on 8th February, 1935, for a very tender and enlarged spleen which was hard and not freely movable. She gave a history of fever without rigors five years previously which continued for three years or so, and during the last two years she did not have any fever, but the spleen kept on enlarging and became very tender. She gave a history of melæna and had it while in hospital. Had two crops of petechial hæmorrhages, one before and one immediately after the operation. She also gave a history of having black vomits (hæmatemesis). Liver

informed that the patient had conceived. Since then she had left Cuttack.

*Case 4.*—D. D., Hindu male, aged 17, was admitted on 9th November, 1934. This case is especially interesting as he was discharged on 1st May, 1935, and died of ptomaine poisoning on 29th January, 1936, and we were able to do a post-mortem examination on him.

The patient did not give any history of malarial fever and according to him he noticed that the spleen had started to enlarge only three months previously. This is, however, hard to believe. He was emaciated and anæmic. All the clinical diagnostic tests were negative. He was operated on on 10th January, 1935. The spleen weighed four pounds seven ounces, the liver was enlarged six finger-breadths below the costal arch and was distinctly hobnailed.

One month after operation he had a severe attack of urticaria from which he suffered very often and came several times to the hospital for relief. He definitely stated that he never had urticaria before. It is interesting to note that the removal of the spleen upset his metabolic balance somehow. He was readmitted on the night of 28th January, 1936, for acute ptomaine poisoning and died in the early morning. Post-mortem examination showed that the liver had become much smaller than before and the hobnails smoothed out.



Fig. 2.

was enlarged and hard. The spleen extended midway between the umbilicus and the symphysis pubis and two inches across the middle to the right. Kahn's test was strongly positive but Wassermann test was negative.

The case was diagnosed as splenic anæmia and though the spleen was not movable it was decided to operate. She was treated with heavy doses of iron and also arsenic, milk injections, liver by the mouth, etc. She was operated on on 26th March. There were dense adhesions. The tail of the pancreas was very adherent and started to bleed profusely and had to be tied. The liver extended five fingers below the costal arch and showed that the hobnail process had begun. The spleen weighed four and a half pounds and measured 10 by 6 by 2½ inches. I was very anxious about the pancreas, but beyond a rise of temperature for three or four days there was no untoward symptom. The patient improved considerably in health, her weight which was 44 pounds before operation went up to 63 pounds and, if the weight of the lost spleen be taken into account, she had gained over 50 per cent in weight.

The blood count was as follows:—

Date	..	..	..	..
Red blood cells per c.mm.	..	..	..	..
White blood cells per c.mm.	..	..	..	..
Hæmoglobin per cent	..	..	..	..
Polymorphonuclears per cent	..	..	..	..
Lymphocytes per cent	..	..	..	..

The patient's relatives took her away on 12th April. She came after three months, and was reported to be doing well. After six months my lady doctor was

The omentum and a small area of the fundus of the stomach were adherent to the diaphragm where the spleen had been adherent. The stomach was dilated.

There was nothing noticeable in the blood count which improved from 3,850,000 per c.mm. on 20th November, 1934, to 4,560,000 per c.mm. on 9th March, 1935. The diagnosis in this case was doubtful. There was no history of melæna, hæmatemesis or petechial hæmorrhages.

*Case 5.*—A., Hindu female, aged 11, was admitted on 22nd March, 1935, for cirrhosis of the liver and ascites. The spleen was enlarged, hard and not very movable and extended two finger-breadths below the level of the umbilicus. The liver was slightly enlarged but very tender. The patient was emaciated, abdomen protuberant, legs swollen, gums spongy, gave a history of hæmatemesis and petechial hæmorrhages. There was no history of fever and rigors (she came from a non-malarious area); the usual clinical tests yielded negative results. She was operated on on 13th June, 1935. The spleen was hard and weighed two pounds three ounces, quite big enough for a girl of eleven, and measured

1st March	24th March	12th April
2,920,000	3,200,000	4,000,000
5.625	6.250	..
50	60	..
62	48	..
28	45	..

9 by 6 by 3 inches. The capsule was thickened and there were dense adhesions. The liver was markedly hobnailed with thick prominent buttons all over the

surface. The gall-bladder was thickened and adherent to the omentum.

From the appearance of the liver I did not expect the patient would survive the anaesthesia but she made an uneventful recovery and left hospital on 9th July. The liver was normal in size and there was no tenderness.

The blood counts on different dates were as follows:—

Date	..	..	..	..
Red blood cells per c.mm.	..	..	..	..
White blood cells per c.mm.	..	..	..	..
Hæmoglobin per cent	..	..	..	..
Polymorphonuclears per cent	..	..	..	..
Lymphocytes per cent	..	..	..	..

The diagnosis was Banti's disease (splenic anaemia).

The patient came again on 20th March, 1936, at my request and the blood counts were as follows:—

Red blood cells per c.mm.	..	4,720,000
White blood cells per c.mm.	..	15,625
Hæmoglobin per cent	..	85
Polymorphonuclears per cent	..	50
Lymphocytes per cent	..	35

The high white cell count is not understood but the little girl looked very healthy and plump. This case shows definitely that splenic anaemia can be cured by splenectomy.

Case 6.—B. M., Hindu male, aged 18, cultivator, was admitted on 10th May, 1935, and gave a history of occasional attacks of fever without rigors. He first noticed the enlargement of the spleen five years ago, but did not have any treatment. On admission the spleen extended two and a half inches below the level of the umbilicus and two inches across the middle line to the right.

The patient was profoundly anæmic, thin and emaciated, and complained of dyspnoea after the slightest exertion. The abdomen was protuberant with dilated superficial veins extending to the chest wall.

No malarial parasites were found. Kahn's test was negative. Ankylostoma ova were found for which treatment was given.

The patient was given the routine prolonged course of quinine, iron, arsenic and injections of milk and liver extract. He was operated on on 8th August. The spleen weighed six pounds ten ounces and measured 10½ by 7 by 3½ inches. There was a fair amount of adhesions, the tail of the pancreas was very adherent to the spleen and bled considerably while being separated. The liver was enlarged four finger-breadths below the costal arch and had a slightly roughened surface but was not definitely hobnailed.

The blood counts were as follows:—

Date	..	..	15th May
Red blood cells per c.mm.	..	..	2,800,000
White blood cells per c.mm.	..	..	4,000
Hæmoglobin per cent	..	..	45
Colour index	..	..	0.8
Polymorphonuclears per cent	..	..	55
Lymphocytes per cent	..	..	24
Large mononuclears per cent	..	..	5
Anisocytes and poikilocytes	..	..	present

After operation the patient was given only good food with extra milk and fruits, and when discharged he was a picture of health. He came to see me in January 1936; he continued to enjoy good health. The diagnosis in this case was doubtful.

Case 7.—J. N., Hindu male, aged 38, was admitted on 13th September, 1935, for enlarged spleen and ascites. Duration five years. Formerly he used to have high fever and rigors, but during the last two or three years he seldom had fever but the spleen kept on enlarging and cachexia, ascites and oedema of legs supervened. He gave a history of gastric and bowel hæmorrhages. Liver was very enlarged, tender and hard. All clinical diagnostic examinations gave negative results. He was operated on after three months' medical treatment. The spleen weighed five pounds and measured 10 by 6 by

4 inches. There was perisplenitis and the capsule was one-eighth inch thick in places. The adhesions were very dense but fortunately not very vascular. The liver was hobnailed with fissures running across the upper surface. The surfaces were rough. There was a fairly large quantity of ascitic fluid. The oedema disappeared a few days after the operation, the ascites

27th March	28th May	6th July
3,100,000	3,700,000	4,900,000
5,200	5,625	6,000
60	65	80
65	60	50
25	25	35

did not reappear and the patient was discharged on 5th February, 1936, quite fit and strong.

The blood counts were as follows:—

Date	..	..	20th Octo- ber, 1935	4th Febru- ary, 1936.
Red blood cells per c.mm.	..	..	3,250,000	4,350,000
White blood cells per c.mm.	..	..	6,875	9,375
Hæmoglobin per cent	..	..	60	80
Polymorphonuclears per cent	..	..	62	45
Lymphocytes per cent	..	..	26	30

The diagnosis was Banti's disease (splenic anaemia).

I saw the patient again on 25th March and he appeared to be in good health.

The following three cases have already been published in the May 1935 number of the *Indian Medical Gazette*, and I shall give only a short summary of these cases to show their progress:—

(1) G. S., aged 30, was operated on on 29th July, 1933, for malarial enlargement. Spleen weighed four pounds one ounce. The patient had been incapacitated and had been unable to earn a living for two years preceding the operation. Some months after the operation he applied to be enlisted as a warder in the jail. He was passed physically fit by the jail doctor but was not taken in because of other reasons. Since then he has reported to me several times and except for attacks of malarial fever at intervals he is fit and works as a field labourer. Most villages in Orissa are malaria-stricken and almost every one suffers from malaria but a splenectomized person does not seem to suffer more than others.

(2) D. S., aged 26, was operated on on 28th October, 1932, for a cystic growth in connection with an enlarged spleen. The cyst was found to be due to intracapsular rupture of the spleen and filled up the whole abdomen. The spleen weighed five pounds twelve ounces. Since the operation the patient had been regularly coming to

16th June	11th July	15th October
3,040,000	3,560,000	5,600,000
4,375	5,000	6,000
50	60	85
0.8	0.8	0.9
58	56	35
24	26	50
6	6	10
present	present	absent

see me every six months or so. Three months after leaving hospital, he was working as a porter. Later on he went home and was working as a field labourer. For the last six months he has gone to Calcutta for work. He must be feeling very fit to leave home and go to seek employment outside his province.

(3) N. S., Hindu male, aged 15, was admitted on 14th September, 1933, for enlarged spleen which nearly touched the symphysis pubis. Gave a history of fever with rigors for the last seven years. He was operated on on 24th January, 1934. Spleen weighed four pounds six ounces and measured 8 by 6 by 4 inches. Liver was enlarged four finger-breadths below the costal arch. Surface was slightly rough but not hobnailed. The omentum was adherent to the gall-bladder. One of the

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## SODIUM EVIPAN ANÆSTHESIA

By A. C. DEY, L.M.F.

*Senior Resident Medical Officer, Astanga Aurveda Hospital, Calcutta*

In this article, my object is to point out the main advantages and disadvantages of sodium evipan anæsthesia and the difficulties that may arise in the course of its administration. I think I need not describe in detail the method of its administration as many articles have appeared from time to time in different medical journals.

In this series the youngest patient was a boy of sixteen and the oldest was a man of seventy-two; the series includes cases of inguinal hernia (including strangulated hernia), large hydrocele, removal of tonsils, dilatation and curettage, extensive cellulitis, removal of cysts, etc.

This drug is a derivative of barbituric acid, is a white powder, easily soluble in cold sterile distilled water, is manufactured by the German firm Bayer-Meister Lucius, and is sold in the market in two different doses. The first one contains 1 gramme with 10.5 c.cm. sterile distilled water and the second dose contains 0.5 gramme with 5 c.cm. sterile distilled water.

As evipan narcosis starts immediately and exists for a short period, it is desirable that all necessary preliminary preparations for the operation prior to evipan administration, such as dressing of the surgeon and his assistants, cleaning of the area to be operated upon and application of antiseptic preparation to the part (we used mercurochrome .1 per cent solution, or brilliant green 0.5 per cent solution instead of tincture of iodine, as the conscious patient feels an extreme burning sensation if tincture of iodine is applied to the recently-shaved area), should be finished before the solution is given. Not a single minute should be wasted after the vein is punctured.

The technique of injection is simple—the vein of the anti-cubital space is selected and the anæsthetist preferably stands opposite the surgeon. Regarding the rate—I have given the

first 3 c.cm. at 10 seconds per c.cm. The average induction dose for a healthy adult weighing 8 to 10 stone is from 4 to 5 c.cm. of the first dose. After the first 3 c.cm. are injected, the anæsthetist should wait for half a minute or so and again continue to inject small quantities until the patient gets completely under. The disappearance of conjunctival reflex and the relaxation of the jaw take place within a minute or so after the injection of the induction dose. At this stage in eight cases of this series violent muscular tremors of the body, arm and legs occurred and the operator should be careful lest the needle slip out of the vein. Immediately the patient gets under, the blood pressure falls, the pulse rate becomes rapid and the respiration becomes slow. It has been reported by some that at this stage bronchial irritation with cough occurs in those suffering from pulmonary complications but it has not been observed in any of my cases although it has been given in cases with severe pulmonary complications. As usual, to facilitate easy respiration, the head should be lowered and the jaw maintained in the right position.

In a case of hydrocele in this series, a robust healthy young man weighing 12 stone could not be brought under even after the injection of 10 c.cm. (1 gramme) and the patient had to be operated on under syncaïne anæsthesia. A similar result occurred recently in a case of right-sided inguinal hernia (with hydrocele both sides and where the appendix had to be removed) in a healthy adult weighing 9 stone. The operation which lasted 1 hour and 42 minutes had to be finished by ether anæsthesia.

In a case of abdominal hydrocele, violent muscular tremors occurred in the first stage, that is, after the injection of the induction dose, remained quiet for about 15 minutes and in the terminal stage of operation he again started having muscular spasms with obstinate hiccough. He was immediately given an injection of 25 c.cm. of a 25 per cent solution of glucose intravenously which, however, stopped the hiccough.

In a case of hydrocele, after an injection of 8 c.cm. of the first dose, the patient remained

(Continued from previous page)

splenic veins ruptured during manipulation and caused sudden severe hæmorrhage. The patient made an uninterrupted recovery and was discharged on 19th February.

The blood counts were as follows:—

Date	..	..	..	..	..
Red blood cells per c.mm.	..	..	..	..	..
White blood cells per c.mm.	..	..	..	..	..
Hæmoglobin per cent	..	..	..	..	..
Polymorphonuclears per cent	..	..	..	..	..
Lymphocytes per cent	..	..	..	..	..

The patient was seen at Puri by one of my assistant surgeons in July 1934 and he was keeping very fit. At

our request he came to see us again in July 1935. The red cell count was 5,800,000 per c.mm. and hæmoglobin 85 per cent. This abnormally high red cell count after such a long interval following the operation is not understood, but the patient was otherwise very healthy

30th September, 1933	14th January, 1934	19th February, 1934
3,120,000	4,200,000	4,400,000
8,400	5,625	11,250
55	65	75
47	56	62
17	25	24

and is working as a servant in a chemist's shop where he has to work hard.

unconscious for a period of 7 hours after the operation was complete and the rate of respiration fell to 8 per minute. This patient, a *sadhu*, was kept under strict observation and nothing was done except free air was given and the patient was found to be quite well next morning.

An old lady suffering from a sinus in the leg was given a total injection of 5 c.cm. which kept her unconscious for 6 hours. An injection of glucose was given intravenously. No other untoward result occurred.

In six cases of this series it has been observed that the patients got extremely restless after the operation and they all had to be given injections of morphine or eukodal to keep them quiet.

Recently, in a case of dermoid cyst on the scalp, in a healthy adult male weighing 11 stone, the induction dose was 4 c.cm. A total injection of 10 c.cm. with 4 ounces of ether was used to complete the operation. Immediately after the sodium evipan injection was complete an urticarial rash began to appear all over the body, being most prominent over the extensor surfaces of the arms. Nothing was given to the patient and the rash disappeared completely within half an hour of its appearance.

#### Conclusions

(1) Evipan sodium appears to be a safe short narcotic if administered with a little care.

(2) As the period of anaesthesia does not last more than 25 minutes in a healthy adult with a full 1 gramme dose, ether should be kept ready to prolong the anaesthesia if required.

(3) In a few cases some untoward results, such as violent muscular tremors, hiccough and restlessness after operation have been observed. But untoward complications like failure of respiration or of the circulation did not take place in any case in this series although it has been used in old and debilitated patients where the use of chloroform or ether would have been absolutely contra-indicated.

(4) It has been observed by some writers that it can be administered single-handed; this, in my opinion, is not a very safe procedure. As a matter of fact, the individual susceptibility to the action of evipan is not known prior to its administration and any untoward result may follow—it is always wiser to keep a competent assistant ready with all necessary equipment to cope with them, both in hospital as well as private practice.

(5) The retail price of 1 gramme of sodium evipan with 10.5 c.cm. re-distilled water is more than that of 2 ounces of chloroform. The length of anaesthesia that can be obtained by this amount of chloroform is more than that of evipan. Therefore, it is desirable that in order to popularize the drug the price should be lowered.

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## A SHORT NOTE ON THE DIAGNOSIS OF PULMONARY TUBERCULOSIS\*

By D. R. DHAR, M.B., D.T.M. (Cal.), M.R.C.P. (Lond.)  
Honorary Junior Visiting Physician, Medical College,  
Bengal; Visiting Physician, Chittaranjan Hospital,  
Calcutta

In its variety of manifestations pulmonary tuberculosis stands unique. The earlier the disease, the more difficult is the diagnosis. But there are other difficulties too, specially for the young practitioner and the student. In practice, what we do not look for in the patient is not generally encountered. Because of the extreme frequency of pulmonary tuberculosis, every physician should expect to see it in all cases with a reasonably suspicious history.

The history of frequent colds, persistent unexplained cough and expectoration, loss of strength and weight, vague indifferent health or failure to regain strength or nervous breakdown after influenza or colds, specially when these symptoms are felt more aggravated in the evening, digestive disturbances not explainable by ordinary means, slight shortness of breath, pain in the chest, blood spits, feverishness, tachycardia, pleurisy, etc., should arouse suspicion, specially if there is a history of exposure to tuberculous infection, either in the family or anywhere else. A tuberculous family history is a helpful additional point which should receive only its proper share of not undue importance. But in our actual practice generally the patient seldom spontaneously gives out more than one or two symptoms, even when there are others to be elicited by the doctor by leading questions. It appears that in the diagnosis of early pulmonary tuberculosis, not only leading questions, but all other devices to get a complete list of complaints in addition to the proper history are of service. Besides the history and complaints of the patient the important requisites for a proper diagnosis are—careful observation of the patient with record of pulse rate, temperature, taken orally four-hourly, specially in the afternoon and at night, with a record of weight, characteristic or suspicious physical findings, x-ray examination of the lungs, tuberculin test and others. In all reasonably suspicious cases, the patient should be kept under observation and examined repeatedly until tuberculosis of the lung has, in all probability, been eliminated.

The first indications are usually in symptoms than in signs and are extremely diverse and may

\*This paper was selected by the special editorial committee for the tuberculosis number of the *Indian Medical Gazette*, but was held over by the editor on account of lack of space.

(Continued from previous column)

In conclusion, I desire to express my sincere gratitude to Dr. D. P. Ghosh and Dr. S. C. Das for their valuable help, advice and kind permission to use the drug in suitable cases.

relate to any organ of the human system, hence the difficulties of diagnosis are great, specially at the very early stages.

Pottenger lays stress upon motor and sensory symptoms, which are caused reflexly by the inflammation of the lungs.

Early pulmonary tuberculosis depends, in the great majority of cases, on probabilities rather than on certainties, as the signs and symptoms may be indefinite and not always incompatible even in health.

The undue stress laid upon the occurrence of slight symptoms and of slight departure from normal health and upon equivocal abnormal physical findings has been a source of confusion to the young practitioner.

For diagnosis the presence of one or more of the following are of great help :—

(1) Hæmoptysis, generally profuse but usually of more than one drachm, is commonly said to be present in about 60 per cent of all cases (Osler, 1925). But authorities differ in their figures varying between 24 to 80 per cent depending, besides on other factors, on the stage of disease, the age and sex of the patient, and the time spent under observation.

(2) Pleurisy with effusion. A large proportion, about 66.3 per cent, in a series of cases of pleurisy with effusion turned out to be tuberculous, as diagnosed by our modern methods including the x-ray findings. That all such cases are due to tuberculosis appears too sweeping a statement.

(3) Persistent moderately-coarse crepitant râles (Burrell, 1936) above the third rib or the third vertebral spine, present even after coughing, were found in 42 per cent of a series of cases analysed by Fellows (1934).

(4) Roentgenological findings of a proper and positive type. In Fellows' (*loc. cit.*) series of 141 cases of healthy applicants for life insurance, the x-ray examination of the lungs showed about 65 per cent in the minimal stage and about 30 per cent in the moderately advanced and 5 per cent in the advanced stage of pulmonary tuberculous infection.

In this connection the following remarks by Burrell (*loc. cit.*) are noteworthy : 'Physical signs are notoriously misleading in the diagnosis of tuberculosis of the lung, and it is possible for advanced disease to exist without any physical signs being detected even after careful examination by experienced physicians'.

Kattentidt (1929) of Munich has emphasized the importance of scrutinizing the suspicious cases by fluoroscopy. Taylor (1935) stresses the importance of x-ray examination of the lung for the determination of the type of tuberculosis—either exudative or productive.

(5) The presence of tubercle bacilli in the sputum. Failure to examine the sputum is inexcusable. One has personally seen great confusion in the diagnosis and consequently in the

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## ACUTE INFLAMMATION OF THE ATTIC —ITS DIAGNOSIS AND TREATMENT

By ABDUL RASHID, M.B., B.S. (Pb.), M.R.C.S. (Eng.),  
' L.R.C.P. (Lond.), D.L.O. (Lond.), P.C.M.S.

*Demonstrator of Anatomy and Officer in charge of the  
Ear, Nose and Throat Out-patients, King Edward  
Medical College, Lahore, Punjab*

It is quite common to meet cases of acute middle-ear catarrh, but cases of acute catarrh of the attic are less frequent, though not rare. The following case may, therefore, prove of interest :—

A male patient, aged 45 years, had an attack of severe cold with sore throat and sneezing. After three days he complained of severe pain in the right ear and later in the left ear also. There was deafness but not so marked as in cases of acute middle-ear catarrh. He had a feeling of heaviness and fullness in the ears but pain was an important feature from the very commencement.

*Examination.*—Nose and throat showed mucosal congestion. In the right ear Shrapnell's membrane was dark red and slightly bulging. The *par tensa* of the tympanic membrane did not show the slightest indication of inflammation in the form of congestion or prominence of the handle of the malleus. The left ear showed the same appearance except that the congestion was not so marked in the attic region. There was no discharge from either ear. The patient improved by the conservative treatment to be described later.

The question arises why the attic region should only be involved and leave the *par tensa* unaffected. One possible reason is that the eustachian tube is not blocked in this condition as it frequently happens in acute middle-ear catarrh and consequently the ventilation and drainage are not interfered with. At the base of the attic region the lateral and the medial walls of the middle ear are very close to each other and the narrow space in between is occupied by the neck of the malleus and the long process of the incus. Therefore, it is quite possible for the mucosa when swollen up to shut up the attic from the tympanic cavity proper

(Continued from previous column)

treatment of a case for the neglect of this simple but very important test. This is a very positive and diagnostic finding.

Due to its protean manifestation, some diseases are mistaken for it, and, what is more important for the patient, that pulmonary tuberculosis has been mistaken for other diseases. So in the diagnosis one should try to think of the diseases which simulate and those which may simulate pulmonary tuberculosis.

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and thus localize the inflammation. The other point to clear is the question of deafness. In acute inflammation of the middle ear it is the pressure of the exudate on the tympanic membrane and ossicles which causes deafness. In attic inflammation this does not occur. Pain is the most important feature of the inflammation of the middle ear, which is usually very intense and distressing. It is induced even by the slight pressure of the exudate because the threshold of stimulation of the trigeminal nerve for pain sensation is particularly low.

*Diagnosis.*—Inflammation confined to the area of Shrapnell's membrane which is not easily accessible to view may be missed in a hurried routine examination. The plane of the tympanic membrane being inclined, from above downwards and inwards, its lower and anterior part is first visualized and if no changes are observed the absence of attic disease is hurriedly presumed.

The only way of visualizing Shrapnell's membrane is by bending the patient's neck away from the observer who should then stoop and look up to see it. Another cause of missing attic disease is lack of thorough examination of the external ear and tympanic membrane. The temptation to form an opinion regarding the tympanic membrane without adequate and thorough cleaning of the external auditory meatus should be strongly resisted. Partial cleaning is not only useless but leads to erroneous diagnosis. The process of cleaning the external auditory meatus until no discharge or debris is left behind is very tedious and painstaking, but is amply rewarded when thoroughly carried out.

*Treatment: Local.*—The nasopharyngeal condition should receive adequate attention. Hot saline gargles and boro-glycerine paints are advised owing to their sedative action. Mandl's paint being an irritant is better avoided in acute stages. Lozenges containing potassium chlorate and menthol through their demulcent and sedative action would prove helpful and soothing.

Nasal douching under pressure carries the risk of extending the inflammation high up and may, in rare cases, lead to intracranial complication. It is to be discouraged. Acute inflammations of the throat are always associated with a mild degree of lymphangitis. This accounts for the feeling of stiffness and discomfort in the neck which is relieved by hot applications in the shape of antiphlogistine or some similar application. Treatment of the ear itself depends on the severity of the lesion. In early cases a piece of gauze soaked in warm glycerine with 5 per cent carbolic acid is plugged in the ear every four hours. A hot water bottle is applied on the ear. Moist heat in the shape of steam playing over the external ear also gives material relief.

In severe cases where the exudate causes bulging in Shrapnell's area with marked redness an incision should be made under aseptic precautions. Subsequent care of the wound should insure complete freedom from secondary infection.

*General.*—The room temperature in cold weather in India should be about 56°F. Air draft should be avoided. As regards feeding, the axiom is 'give nothing too cold or too hot'. Drinks such as tea, or warm milk, are very comforting, but these should be sipped. Hot spiced food is not advised, because it irritates the inflamed mucosa of the throat. Laxatives such as pulv. glycyrrhiza compound in 1 to 2 dr. doses are very helpful. Internally, salicylates are very useful. They relieve pain and are supposed to combat streptococcal infections.

The real point is never to treat such cases as of simple acute middle-ear disease because attic is a key to the mastoid antrum and other mastoid ear cells. Therefore infection can readily extend to the mastoid region. It is best to keep such cases under close observation.

When the acute stage is over the eustachian catheterization and inflation should be done twice or thrice to get rid of residual exudate if any.

## A Mirror of Hospital Practice

### A CASE OF PULMONARY TUBERCULOSIS, COMPLICATED WITH SYPHILIS

By A. C. UKIL, M.B., M.S.P.E. (Paris), F.S.M.F., F.N.I.  
Calcutta

In October 1936 a young Hindu male, aged 27 years, a resident of Bishnupur (Bankura), came to me with the following complaints:—Enlarged glands in the cervical, axillary and inguinal regions for five months, slight fever off and on during the same period, and loss of weight by 12 pounds in five months. He did not complain of any cough.

*Previous history.*—He had an attack of pleurisy on the right side six years ago. It recurred very slightly from time to time.

*Family history.*—Father had asthma and died 15 years ago.

*Physical examination.*—Pulse—94 per minute at the time of examination.

A small ulcer was noticed on the roof of the mouth.

*Glandular system*—there was general polyadenitis, including the epitrochlear glands.

*Chest*—there was a slight retraction of the right shoulder, with a slight loss of resonance and increase of vocal fremitus over the right upper lobe. A few râles were audible over the area on auscultation.

*X-ray examination.*—A skiagram of the chest taken in 1932 showed a normal pulmonary parenchyma but a very clear-cut Ghon's body was noticed in the lower part of the left lung. The skiagram taken in October 1936 showed a very productive—rather calcifying—infiltration over the right apex and the sub-apical region with a few small honeycombed cavities, which from their appearance appeared to me to be at least three years old (*vide* plate XXI, figure 4).

*Sputum*—scanty; no tubercle bacilli.

*Blood*—showed an eosinophilia of 50 per cent and the Wassermann reaction was strongly positive.

*Points of interest in this case.*—Generalized polyadenitis occurs during the second stage of Ranké in tuberculosis, when dissemination chiefly takes place through the circulatory and lymphatic systems after primary infection. One would not expect, therefore, in such a case to find a healed primary focus (Ghon's body) in one lung and a productive re-infection type of tuberculosis in the other lung, if the glandular involvement had been due to tuberculosis.

We had, therefore, to decide which of the two factors, tuberculosis or syphilis, was the more active producer of the clinical symptoms in this case. The ulcer on the palate and the enlarged glands suggested the co-existence of syphilis, which was proved by the blood examination. One would not expect such a rapid loss of weight in a case with a calcifying tuberculous focus, particularly as the urine did not show any sugar. We decided, therefore, to break the more active link in the vicious circle.

The patient was treated with alternate intramuscular injections of solu-salvarsan and bismotab.

The ulcer in the mouth healed within a month and the glands became much smaller. The râles in the lung disappeared. The patient became fever-free and regained the 12 pounds which he had lost in five months. From this time on, novarsenobillon intravenously was substituted for solu-salvarsan. After another month, no glands were palpable. The patient gained further in weight; the pulse rate came down to normal and he became symptom-free. He was given a mixture containing liquor hydrargyri perchloridi and potassium iodide and was advised to go to his home for a couple of months.

The points of interest in this case are that a knowledge of the pathology of infection and allergy in tuberculosis and the appearances found on x-ray examination helped us to diagnose and treat the more active pathological condition (syphilis) to the benefit of the patient who was, as a matter of fact, being treated before this for tuberculosis.

I expect the tuberculous lesion in the right upper lobe to retrogress and I do not propose to adopt any specific measures beyond telling him to avoid excessive physical and mental strain.

### DERMATITIS ARTEFACTA

By P. A. MAPLESTONE, D.S.O., D.S.C., M.B., B.S., D.T.M.

L. M. GHOSH, M.B. (Cal.), D.T.M.

and

D. PANJA, M.B. (Cal.)

(From the Department of Dermatology, School of Tropical Medicine, Calcutta)

A MARRIED woman, aged 18 years, was admitted into the Carmichael Hospital for Tropical Diseases on the 18th November, 1936, with numerous indolent ulcers on the body, face and limbs.

*History.*—She said she had been troubled with irregular febrile attacks for the past two years. About fifteen months ago she received an injury to her left hand from a piece of bamboo, and the resulting ulcer persisted for about ten months. The present lesions began to appear shortly after the initial injury; at first they were on the left forearm, not far from the injured spot, and in the last five months they had gradually spread until the whole body surface was involved.

*Examination.*—Altogether 104 ulcers were found and they were distributed as follows: Face and forehead

12, right arm 18, left arm 17, chest 18, abdomen 2, back 7, buttocks 4, right leg 13, and left leg 13. They were discrete and fairly widely separated from each other, the two nearest being over one inch apart and the intervening skin was perfectly healthy (plate XXI, figure 1).

Each lesion was a small circular or oval punched-out ulcer not more than a quarter of an inch in diameter. They were covered with a blackish tenacious scab, not unlike the tissue in dry gangrene, and the edges were slightly raised. When the eschar was removed by fomentation the ulcers were found to be about 1 to 2 mm. in depth with a red healthy granulating base. This description applied to most of the ulcers, but a few were infected with pyogenic organisms and these resembled the lesions of impetigo. There were so few in this state that the infection was obviously only accidental and secondary and in no way responsible for the disease. There were also a few healed scars from old ulcers.

The general health of the woman was good and nothing abnormal was found except that her tongue was very inflamed and there was considerable denudation of the epithelium. No nervous signs were elicited. Routine examinations were negative with the exception of a mild hookworm infection which was cured with a single dose of tetrachlorethylene.

Two days after admission the woman was photographed, she was thoroughly examined and a small portion of tissue removed from one of the ulcers for microscopic examination. Her manner during these various operations excited our suspicions which had already been aroused on account of the peculiar distribution and type of the lesions, which resembled no known skin disease. The suspicion was soon confirmed because two more ulcers developed on her arm within three hours of her return to the ward after the above examination and, except that they were slightly more cedematous than the older ulcers, they were of exactly the same type as the latter. She strenuously denied that these new lesions were produced by herself, and although nothing which she might be using had been found in her belongings a more detailed search by a nurse brought to light a small tin box, tied in the corner of the saree. This tin contained a white powder lying loose and a whitish paste wrapped in paper.

Analysis of these substances in the department of chemistry resulted in their identification as commercial soda and lime. The reaction of these substances in the presence of water is to form caustic soda, and the state of the woman's tongue indicated that she had been placing a little of these two materials on the end of her finger, moistening it by placing it on her tongue and then applying it to her skin. The thick skin of the fingers, where the mixture only remained for a few moments, was not affected. Confirmation that soda and lime moistened with water and applied to the skin would produce lesions of the type described was obtained by two of us applying it to our own skins (plate XXI, figure 2).

After removal of the tin from the woman's possession no more lesions appeared and her tongue was also rapidly recovering, but she would not remain in hospital until she was completely cured because after her deception had been exposed she was anxious to leave. On account of the rapid recovery of all the ulcers that was taking place, and the very few scars of healed ulcers that were present, it is extremely doubtful if the condition had been present for as many months as she said.

The section of tissue removed from one of the ulcers is of interest because at the edge of the ulcers there is abrupt change from perfectly healthy skin to a mass of coagulated debris which occupies the bed of the ulcer (plate XXI, figure 3). The ulcer extends throughout the depth of the skin and is surrounded by healthy tissue which only shows a certain amount of oedema and slight cellular infiltration. In the deeper portions of the coagulum a few deposits of calcium were seen, these are obviously from the material applied to the skin.





Fig. 1.

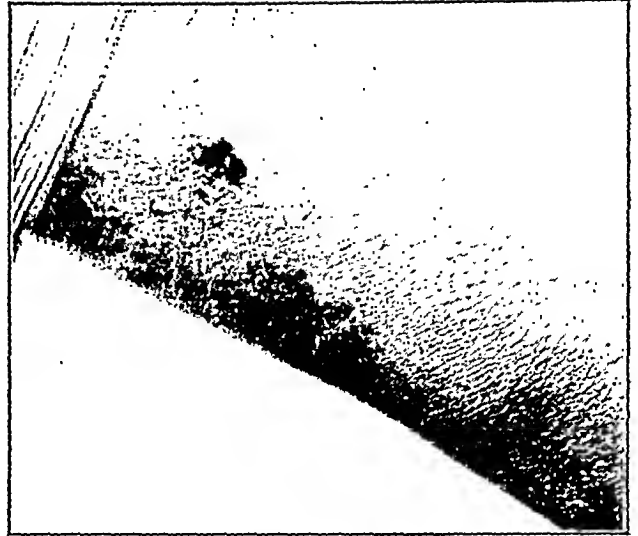


Fig. 2.—Control lesion produced on one of the writers.



Fig. 3.—Photomicrograph of section at edge of ulcer showing abrupt transition from healthy skin on the right into coagulated debris on the left.

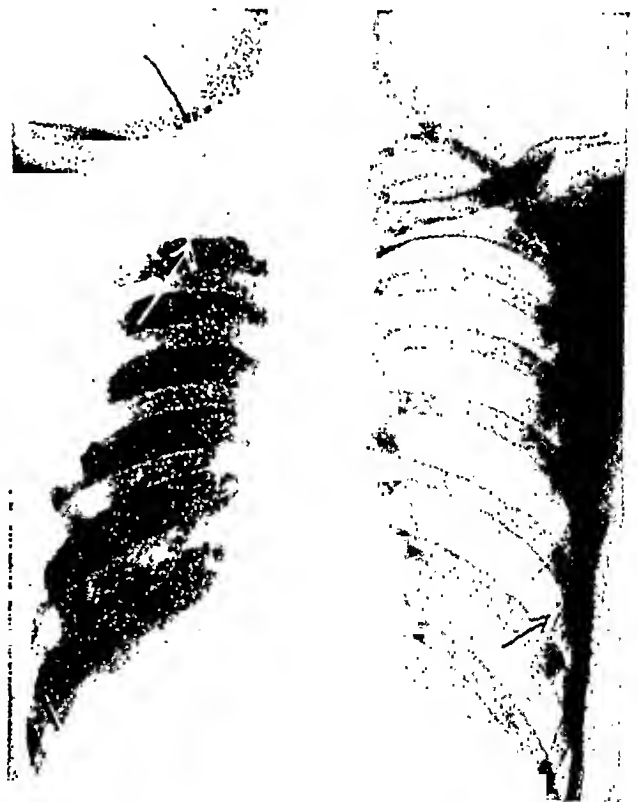


Fig. 4.





Inquiries from the woman's husband and relatives did not reveal any history of hysteria in any recognizable form, and there was no evidence of skin anaesthesia which is somewhat remarkable because the production of these ulcers caused considerable pain to normal individuals. A possible explanation of the cause of the condition is that the woman's husband was employed in Calcutta and only visited her in her village for about a month every year, so she may have hit upon this method of injuring herself with the idea of being brought to Calcutta for treatment and thus being reunited to her husband. If this is correct she succeeded in her object but was probably disagreeably surprised by the ultimate outcome of her efforts.

It may be asked, how was it that a comparatively ignorant village woman would discover the caustic effect of combining soda and lime? but this is readily explained by the fact that it is a popular home remedy in India for the removal of warts.

## HYDATID DISEASE

### A CASE REPORT

By ANDREW C. TAYLOR, M.A., M.B. (Tor.),  
D.T.M. (Cal.), F.R.C.S. (Ed.)  
CAPTAIN, I.M.S.

*Indian Military Hospital, Bangalore*

THE ingestion of the ovum of the dog tapeworm results in the development in man of the larval stages of the parasite. The presence of this parasite in one or more of the organs of the body is responsible for a variety of signs and symptoms making up the clinical picture of echinococcosis or hydatid disease.

Normally the dog tapeworm has for its intermediate host an herbivorous mammal, commonly the sheep. Man may accidentally become the intermediate host when he is living in close association with dogs who are excreting ova in their faeces. Following ingestion the embryo hatches out in the upper alimentary canal, enters the portal circulation and lodges in one or another of the organs or tissues of the body. In the vast majority of cases it lodges in the liver. Here the typical cyst forms and slowly enlarges through months and years. In this primary cyst, the parasite lives in perfect harmony with its host, walled off by an impermeable laminated membrane. It gives rise to no sign of its presence, except in the unusual event of its being situated in a confined space such as the orbit or skull, where its growth, even in the early stages, may produce signs from direct compression of delicate or vital structures. Only when it has reached a large size does an unruptured cyst make itself evident as a tumour in such a situation as the liver, spleen, or mediastinum.

With the exception of these compression symptoms, the clinical manifestations of hydatid disease are all the result of complications, and

practically all these complications follow upon rupture of the primary cyst. It may be a sudden frank rupture or a slow minimal leak. It may occur into surrounding tissues, a neighbouring viscus, a closed visceral space, a duct or natural passage or into a blood vessel. It may or may not result in the secondary implantation of the parasite. It may or may not be followed by secondary infection within the cyst. With so many possible complications, it is evident that the clinical manifestations may be extremely varied, and that they will depend on the site of the primary cyst, the degree of its rupture, the tissue or space into which the leak occurs, whether secondary implantation of the parasite occurs, and finally whether or not pyogenic infection supervenes.

Dew divides the complications due to rupture of a cyst into two main groups, i.e., (1) those which accompany any rupture, viz, (a) early anaphylactic shock and (b) late secondary echinococcosis; and (2) the complications peculiar to cysts rupturing into a natural channel, these being (a) the mechanical effects of the passage of the cyst contents and (b) supuration from secondary pyogenic infection.

1. Anaphylactic shock occurs when the cyst fluid comes into contact with the host's tissues and fluids which are thought to have become sensitized by former small leakages from the cyst. It occurs immediately after frank rupture of a cyst, and is usually in a moderately severe form which is rarely fatal. Urticaria is said to be a prominent, but not an invariable, feature of the attack.

2. Secondary echinococcosis, i.e., the development of secondary cysts, is a late complication which is clinically evident only after many months or years. These secondary cysts may form either within the primary cyst or outside the primary cyst in other parts of the body. Secondary cyst formation within the primary cyst, or 'daughter cyst' formation, follows upon some injury to the primary cyst, such as attempted aspiration. Dew has pointed out that in those cases where daughter cysts are found in the absence of any history of injury or interference, the cause is almost certainly a minimal or unrecognized rupture. Secondary cysts, outside the primary cyst, follow upon implantation of scolices carried by the fluid escaping from the ruptured cyst. In the case of a ruptured liver cyst, the secondary echinococcosis may be (i) localized, from the escape of scolices into the surrounding tissues, (ii) peritoneal, following intraperitoneal rupture of the cyst and (iii) metastatic, following rupture of a cyst into a blood vessel. This is a rare occurrence: rupture into a vein is followed by the development of multiple secondary pulmonary cysts, while rupture into an artery results in widespread dissemination of scolices and the development of secondary cysts, most commonly in the brain.

3. Rupture of a primary cyst into a natural passage may occur. Rupture into the biliary passages has been shown by Dew to be quite common and produces symptoms simulating gallstone colic. It may also occur into a bronchus and more rarely into the alimentary or urinary tracts.

4. Suppuration in an hydatid cyst is always preceded by some degree of rupture usually into some natural passage (such as the bile ducts), whence pyogenic organisms can gain entrance to the cyst. It is always a serious complication and usually determines a fatal outcome.

The following case is presented because it illustrates some of the characteristic features of hydatid disease, which have recently been emphasized by Dew and the Australian investigators :—

*Case report: First admission.*—A Hindu woman, aged 33 years, from Alot, Central India, was admitted to the Mission Hospital, Ratlam, on 12th October, 1931. She complained of irregular enlargement of the abdomen,

Large cysts were also felt in the pelvis, kidney regions and on the under surface of the liver. The larger cysts in the pelvis and flanks were shelled out intact with comparative ease. The whole of the great omentum, studded with cysts, was removed. The cyst on the liver could not be shelled out, so it was opened after packing off the abdominal cavity, a clear fluid evacuated and the hyalin membrane removed as far as possible. The cyst and abdomen were then closed without drainage. Forty-eight cysts were removed by this operation. They are shown in the accompanying photograph. These cysts showed the typical laminated membranous inner wall and contained only a clear fluid with some small gelatinous masses in the smaller ones. The post-operative course was uneventful and she was discharged on the 17th day feeling quite well.

*Discussion.*—The condition met with in this case was one of widespread secondary echinococcosis following intraperitoneal rupture of a primary cyst of the liver. Dew states that it takes five to twelve years for a secondarily implanted peritoneal cyst to become clinically evident. Obviously she had the primary infection in childhood, the period when these infections usually occur. It is noteworthy that in



of about one year's duration and of insidious onset. She had had a few attacks of pain, but gave no history of fainting spells. On examination her abdomen was seen to be grossly enlarged, apparently due to a lobulated tumour mass within the abdomen, which was freely movable with respiration and on manipulation. On bimanual vaginal examination a large central abdominal mass was palpated, apparently continuous with the uterus, with smaller nodular masses in the pouch of Douglas. General examination was otherwise negative. She was having no fever and appeared to be in excellent health. A provisional diagnosis of ovarian cyst was made and operation advised.

On 15th October, laparotomy was performed under general anaesthesia. On opening the abdomen the whole omentum was seen to be studded with cysts, varying in size from that of a marble to that of a large orange.

spite of the widespread secondary echinococcal infection her general health was excellent—an example of the great tolerance of the body for this parasite, as long as secondary infection does not occur. Another point of interest is the ease with which these secondary implants were shelled off the peritoneum. In marked contrast was the difficulty experienced in trying to enucleate the cyst on the under surface of the liver. This latter had a thick outer wall of fibrous tissue, whereas the peritoneal secondary cysts appeared to be covered only by a thin layer of peritoneum. Further, it may be noted that no 'daughter cysts' were found. One might have expected

to find, in a primary cyst which had formerly ruptured, some evidence of endogenous secondary 'daughter cyst' formation. Either this did not occur, or else this liver cyst was itself a secondary cyst, the primary one having emptied itself and healed up.

*Second admission.*—On 11th September, 1933, almost two years after her first admission, she returned stating that she had enjoyed excellent health for a year after the operation, but for the past six or eight months she had noticed recurrence of swellings in the abdomen. One of these in the right upper quadrant of the abdomen had recently become painful and tender. She had had attacks of abdominal pain with vomiting during the period. Recently she had noticed some shortness of breath. She had lost in weight, appeared ill, and had a temperature of 100°F. On examination of the abdomen, three distinct tumour masses were palpated, one in the right upper quadrant continuous with the liver, which was definitely tender on pressure; the other two were in the right and left lower quadrants of the abdomen and appeared to arise from the pelvis. The spleen was palpable. There was dullness and absence of breath sounds over the right lower chest. The blood showed a haemoglobin percentage of 70, and a white cell count 10,400 with 60 per cent polymorphonuclear leucocytes and 12 per cent eosinophils. The urine was normal.

After admission to hospital the temperature dropped to normal but the liver cyst remained tender and painful. On the third day she suddenly complained of acute abdominal pain, vomited, and collapsed with profuse perspiration and thready pulse. The cyst formerly observed in the left lower quadrant was found to have disappeared and free fluid was demonstrated in the abdomen. She responded to injections of adrenalin and soon recovered. Following this attack urticarial weals appeared but not markedly. The most distressing symptom was a severe dyspnoea which persisted for about 24 hours. Her temperature rose to 100°F. A swelling appeared over the precordium, to the left of the sternum, which persisted until the next day.

On 18th September she was operated on for the second time. The abdomen was opened by means of an upper right rectus incision, exposing a large reddened and inflamed cyst projecting from the under surface of the liver. There were a number of cysts in both flanks similar to those removed at the first operation. There was no evidence of general peritoneal irritation or inflammation. The peritoneal cavity was flushed out with large quantities of saline. After packing off the abdominal cavity an attempt was made to aspirate the liver cyst but without success, the cannula being plugged with bits of membrane. At this stage, the condition of the patient gave rise to some anxiety, so the cyst was rapidly incised and a milky yellow semipurulent fluid together with bits of membrane and numerous daughter cysts was evacuated. Palpation revealed another cyst deep to this one. This was incised through the base of the first cyst and a large amount of clear watery fluid was evacuated, with no daughter cysts. The condition of the patient did not warrant further exploration and the abdomen was rapidly closed, leaving a drainage tube down into the inflamed cyst.

Following operation, there was copious yellow discharge and the temperature remained normal for ten days. After the tenth day, the discharge decreased, pain returned and the temperature commenced to swing up to 101°F. in the evenings. Permission to reopen the abdominal wound was refused, and on the 17th day post-operative she was taken away by her relatives. We were unable to trace the case but she must have died a short time afterwards.

It had been impossible to obtain an x-ray of the chest before operation, but this was done shortly after the operation. It revealed a large dome-shaped swelling almost filling the right lower chest and merging into the mediastinal shadow. The heart was pushed over to the left.

*Discussion.*—The appearance of this case on her second admission was in marked contrast to her excellent health during the first admission, and the difference appears to have been due mainly to secondary infection of the cyst. It is of interest to note that 'daughter cysts' were only found at the second operation and in the liver cyst which had been evacuated two years before. In all the others (including the deep undamaged cyst evacuated through the floor of the infected cyst) only clear fluid was obtained. This is in keeping with the teaching of Dew, noted above, that endogenous 'daughter cyst' formation occurs only in a cyst which has been ruptured or damaged in some way and is a true secondary echinococcosis in this case following evacuation of the cyst at the first operation. Had the nature of the disease been suspected before the first operation and preliminary sterilization of the liver cyst with formalin, according to Dévé's method, been carried out, this complication might have been avoided.

The source of infection of the liver cyst is a matter for speculation. A long period of uneventful convalescence after the first operation shows that infection was comparatively recent. Most likely some degree of intra-biliary rupture of the re-formed cyst had occurred resulting in secondary infection. It is possible that some of the attacks of abdominal pain with vomiting, to which she had been subject for some months before her second admission, may have been due to biliary colic from the passage of debris or collapsed daughter cysts down the bile ducts. Dew has pointed out that intra-biliary rupture of a cyst is one of the commonest complications of a primary liver cyst, that it is a common cause of biliary colic in endemic areas, and that this is the usual way in which pyogenic infection reaches the cyst.

The presence of secondary infection alters the indications for treatment. In the uninfected cyst a prime consideration is the avoidance of secondary infection. Drainage is therefore definitely contra-indicated. In such a case the ideal treatment is enucleation of the cyst. Failing this it may be opened (preferably following the introduction of formalin to kill the scolices); the chitinous membrane is removed, and the cyst cavity is closed without drainage. Once pyogenic infection has supervened, however, adequate drainage becomes essential.

The large shadow in the skiagram of the chest sufficiently explained the dyspnoea. This appears to be due to a large cyst bulging through the diaphragm, but the interpretation I leave to those who are qualified to pronounce upon it.

*Summary.*—A case is reported which illustrates a number of the essential features of hydatid disease in man:

- (1) Infection usually occurs in childhood, but becomes clinically evident only later in life.
- (2) There is a remarkable tolerance for this parasite even when multiple infection is present.



## A FATAL CASE OF CEREBRAL MALARIA CAUSED BY *PLASMODIUM MALARIAE*

By A. K. GHOSE, L.M.F., L.T.M.

Medical Officer, Ambari Tea Estate, Carron, Jalpaiguri

A COOLIE, aged about 27 years, of good constitution, suddenly fell down unconscious on the 9th November, 1936, and I was called in to see the case on the 10th. I found him in the following condition:—

Fully unconscious, lying flat on his back, slight rise of temperature, pulse and respiration quite normal, spleen slightly palpable, pupils normal.

Not being able to find out any definite cause of the present state I took some blood smears and injected a cardiac stimulant (adreno-ephedrine).

**Previous history.**—There was no previous history of malaria. This man once lost consciousness about a year ago in his native home (Ranehi) and was cured without treatment. Here too, some four months ago, he fell down unconscious in the similar way. At that time there was no rise of temperature and I simply injected a cardiac stimulant as on the present occasion. He came back to his senses after two days practically without any treatment except some general measures such as cold douching over head, administration of stimulants, etc.

**Result of blood examination.**—The films were full of trophozoites and schizonts of *Plasmodium malariae*. From the result of blood examination it occurred to me that malarial infection might play some rôle in the present case.

On the 11th his temperature was 99.2°F. in the morning and 100.4°F. in the evening. Pulse was 98 and respiration 25 per minute.

Quinine bihydrochloride was injected intramuscularly—10 grains in the morning and 10 grains in the evening. Twenty cubic centimetres of 25 per cent glucose solution were given intravenously to support his heart. On the 12th, quinine bihydrochloride and glucose solution were injected as on the previous day. Temperature, pulse and respiration were as before.

On the 13th blood films were again examined and this time only gametocytes (QT) were found. Quinine bihydrochloride 10 grains was injected in the morning. Towards evening he regained some consciousness and responded when knocked, but he was delirious and his speech was incoherent. He was able to take some liquid diet with difficulty. Quinine 10 grains was given orally with brandy.

On the 14th temperature was between 98°F. and 99°F. and pulse was of very low tension. He talked incoherently and did not regain full consciousness. Quinine in dosages of 10 grains in solution was given twice along with brandy. In the evening his temperature became subnormal and he was gradually sinking. Blood was again examined but no parasites were found. He died at night.

**Discussion.**—It is a common experience to come across cerebral cases of malaria caused by *Plasmodium falciparum* but it is quite unusual to encounter *P. malariae* as the causative parasite of cerebral type of malaria as in the present case.

What was the cause of unconsciousness in this case? Was not malarial infection sufficient to precipitate the present attack? My own idea is that his previous conditions were altogether different from his present attack, which is the outcome of malarial infection. Administration of quinine freed his blood of malarial parasites as it is evident from the examination of his peripheral blood. He probably died of heart failure.

In conclusion, it is to be stressed that in cerebral types of malaria the rise of temperature does not bear any relation to the gravity of the condition; in my experience low temperature rather points to grave prognosis as the tissue response is very low in such cases. I reported another case of cerebral malaria in the July 1936 issue of the *Indian Medical Gazette*, in which temperature was very low in comparison to the gravity of symptoms. In that case the life of the patient was saved but there had been some permanent loss of eyesight. Hence, a practitioner should not minimize his line of treatment in a case of malaria with cerebral symptoms because the temperature is low; he should rather consider it a danger signal.

## A CASE OF CANCRUM ORIS AS A COMPLICATION OF BACILLARY DYSENTERY

By A. K. GHOSE, L.M.F., L.T.M.

Medical Officer, Ambari Tea Estate, Carron, Jalpaiguri

A GML, aged about 7 years, was attacked with dysentery on the 23rd April, 1936. Her stool was examined microscopically and the report pointed it to be a case of bacillary dysentery. The attending physician advised a course of dysentery phage and the supply was obtained on the third day of attack from Shillong.

The phage treatment was continued for about a week (three ampoules daily) without any improvement and the condition of the girl was becoming worse.

On the 30th I was called in to attend the case and found her in the following condition:—

Marked prostration, temperature—between 99.6°F. and 102.8°F. Pulse—rapid and of low tension. Stools passed at frequent intervals with great tenesmus, mixed with blood and mucus of greenish colour.

As there were marked signs of dehydration and the patient was in a very low condition, purgative treatment was out of the question. Hence, I advised the following line of treatment:—(i) Bismuth mixture with liquid paraffin, eight doses every two hours; (ii) normal saline with glucose per rectum, 4 ounces every three hours and (iii) adrenalin solution (1 in 1,000), 3 minims twice daily.

On the 3rd May I paid a second visit and found her condition much improved. Temperature was normal in the morning with a slight rise in the evening, frequency of stool much diminished and the colour was now turning yellowish, tenesmus too was much less and the desire for food returned. Her condition seemed to be on the fair way to recovery.

On the 8th an inflammatory mass was noticed on the inner side of the right cheek and there was a sharp rise of temperature to 104°F.

On the 10th I found the inflammatory mass which was circular to be gangrenous, foul odour was present and sloughs were coming in small bits. Temperature was 103°F. and the girl was in great distress; no food could be given by mouth. Her condition was suggestive of general septicæmia. I diagnosed the condition to be due to cancrum oris of the cheek with secondary invasion of blood, probably by streptococci. She was given the following treatment:—

(i) Condy's gargle at frequent intervals; (ii) cleansing of mouth with hydrogen peroxide three or four times a day, and (iii) rectal saline with glucose.

On the 13th the inflammatory mass burst externally and she expired on the night of the 14th.

**Interesting points.**—(a) Cancrum oris is a very unusual complication of bacillary dysentery. As far as I could make out from limited



(3) The clinical manifestations of hydatid infection are due in most cases to complications following upon rupture of the primary cyst.

(4) Frank rupture of a cyst results in an immediate anaphylactic reaction. Such a reaction was observed in this case.

(5) Intraperitoneal rupture of a cyst results in the development of numerous secondary cysts throughout the abdominal cavity. In this case 48 cysts were removed.

(6) 'Daughter cyst' formation is a true secondary echinococcosis. Like all secondary cyst formation, it is a sequel to rupture of a cyst. This rupture may be gross or minimal. In the case reported it followed operative interference.

(7) Secondary infection of a liver cyst usually follows intra-biliary rupture. The history of this case lends support to the view that pyogenic organisms gained access to the cyst in this way.

(8) A grave change in the clinical course and prognosis results from the introduction of secondary infection into the cyst. The indications for treatment in a secondarily infected cyst are quite different from those in an uncomplicated one.

## A CASE OF RUPTURE OF THE VAGINA

By M. K. CROTHERS, M.D. (U. S. A.)

*Memorial Hospital, American Presbyterian Mission, Fatehgarh, U. P., India*

THE following case is reported because it is unique in my experience and in the experience of others with whom I have discussed it. There has been no opportunity for a search of the literature to determine the incidence of this type of case.

Haliman, a 28-year-old Muslim woman, was admitted on the 24th of February. She said she had been having labour pains for three days and that she was at full term. She had seven children, all of whom were born normally. Five are now living and two died in infancy. She admitted having been examined by only one *dai*. The labour pains had stopped shortly before admission to the hospital.

Physical examination (which was hastily and very inadequately done) revealed a very poorly nourished and poorly developed woman. She was very sallow and lethargic but conscious and showed no evidence of surgical shock. The pulse was weak but regular. The abdomen was small for a full-term pregnancy. No uterine contractions were felt. There was no presenting part at the brim of pelvis. In the right hypochondriac region was a movable round mass which in my haste I took to be the head through a very thin uterine wall. The pelvic measurements were: interspinous—7½ inches, intercrestal—8½ inches, and external conjugate—6 inches. No vaginal examination was done. Cæsarean section appeared advisable.

At the time of operation which had to be delayed because of another emergent section it was noticed that the shape of the abdomen had changed and the round movable lump was found in the right lower quadrant of the abdomen. Under ether anæsthesia a paramedian incision was made. When the peritoneum was opened a small amount of clotted blood was encountered and it was seen that the foetus was free in the abdominal cavity. The cord was twice coiled very tightly around the neck and was so short that it had to be cut before

the foetus could be extracted. The foetal head was not unusually large but was severely moulded. It was then seen that there was a rupture of the anterior vaginal wall. The placenta was extracted. No bleeding from the uterus followed the removal of the placenta. The ruptured vaginal wall was extremely œdematous and friable. The rupture extended across the vagina just below the cervix and down the left and right lateral margins of the vagina for a distance of about an inch and a half. The fully dilated cervix could be clearly identified and was intact as was the uterine wall. The endometrium was pale and granular and in distinct contrast to the smooth red epithelium of the vagina. The vaginal wall was repaired by a few light catgut sutures and a cigarette drain was inserted in the pelvis and the abdomen closed in layers.

The patient's general condition seemed little worse after the operation. Twenty-four hours after she developed a large bed sore, an incident in keeping with her general condition of malnutrition. She ran an irregular temperature, about 100°F., which after the ninth day subsided to 99° as a maximum. For a week there was a profuse vaginal discharge of very foul odour. The patient gradually improved and was discharged on the 24th post-operative day.

## CONGENITAL OBSTRUCTION OF THE ANUS

By V. S. HARIHARAN, M.B., F.R.C.S. (Eng.)

*Surgeon, Ramakrishna Mission Hospital, Rangoon*

CLOSELY allied to the condition of imperforate anus is a condition, very rarely met with, which for want of a better term may be called congenital anal obstruction. The following two cases I have had in the last two years explain the condition:—

Patient A, a female child, aged ten months, was admitted into the hospital for difficulty in defæcation. The child was passing motions by herself, but with great straining, and the quantity passed was small and came as a flattened band.

On examination there was a small band of skin one inch long and half an inch broad extending from the posterior margin of the anus to the anterior margin, with a free rugose edge laterally. The little finger could be passed easily into the rectum to the right or left of the band. Whenever the child strained to pass motions, with the dilatation of the anus, this band also stretched, obstructing effectively the passage of the faeces, just in the same way as a rubber band stretched over the mouth of a bottle. With increased dilatation of the anus due to severe straining this band stretched more and more, and the faeces escaped by the sides of this band, and came as a flattened band.

Under local anæsthesia the band was removed by cutting it off from its connections to the anterior and posterior anal margins and there was a well-formed anus exposed with a perfect sphincter. The child, of course, was perfectly all right thereafter.

Patient B, a male child, aged one and a half years, was admitted into the hospital for stricture of the rectum. The child had to strain a lot in defæcation and the quantity passed was small and flattened.

On examination there was a piece of redundant skin about one inch long and half an inch wide attached to the posterior anal margin, the right anal margin and the anterior anal margin, but free along the whole of its left margin. In fact it looked like a hood over the anal aperture. About its attachment to the right anal margin there was less pigmentation, the band was much thinner and there was a dimple on the surface resembling very much the appearance of imperforate anus. The little finger could be passed up into the rectum along the left edge of the band. With the straining at defæcation and consequent anal dilatation

this band also stretched leaving only a slit-like aperture on the left side through which the feces passed.

The band was excised under local anaesthesia and, as before, under the band was a well-formed anus with a perfect sphincter. The child was all right in a few days with no more difficulty at defecation.

The embryological explanation of this congenital malformation is rather obscure. The anal canal is developed from the epidermal invagination of the elaoea (proctodeum) and is originally separated from the rectum by a thin membrane which disappears about the fourth month of intra-uterine life and which occasionally persists in the condition of imperforate anus. Can this condition be due to a duplication of this invagination process one on either side of the middle line, leaving a median band which persists in life? Two membranes are thus formed separating the rectum from the two invaginated parts which together must be regarded as the anal canal. Both the membranes may remain imperforate, or one may be perforate and the other not as in case B, or again both may be perforate with only a median band remaining as in case A.

Or can this band be the persistent remains of the tail process which is seen in the early weeks of intra-uterine life and which instead of disappearing has persisted and formed plastic fusion with the anterior margin of the anus and also sometimes, as in case B, with the lateral margin or margins of the anus as well? The condition is, however, very rare and more study is required to get at the exact explanation of the condition. I am not aware as to whether this condition has been reported before.

### A CASE OF FULL-TERM PREGNANCY WITH UNRUPTURED HYMEN

By E. OSTERGAARD, M.D.

Medical Missionary, Benagaria Christian Hospital,  
Benagaria, Santal Parganas

A CASE of full-term pregnancy with an unruptured and almost imperforate hymen is rare enough to be of interest. When such a hymen has withstood, without rupturing, the impact of the head of the foetus during seven days of labour, as in the present case, it must be classed with the unusual.

A Hindu woman, D. D., aged 24, came to the Benagaria Christian Hospital on the 14th January, 1937, with the history of being in labour for seven days and unable to deliver. Her previous history was essentially negative. Her menstruation had been regular up till the present pregnancy.

Upon examination the patient was found to be in a state of complete exhaustion. Her skin was cold and clammy, the pulse barely perceptible, and it was a question whether or not she could tolerate any kind of operative procedure. The abdomen was enlarged to the size of a full-term pregnancy and the bladder was distended nearly to the umbilicus. The foetal head was found to be distending the perineum, but was kept back by a firm, reddish blue membrane which closed the vaginal opening, and was stretched like a drum by the pressure of the head. This membrane was firmly attached on all sides and was intact, except for a pin-

hole about the middle, through which a few hairs from the head of the foetus protruded. The external genitalia were otherwise normal.

The hymen was incised longitudinally and a fully-developed but dead foetus delivered by forceps. The mother got over the shock of the operation but never recovered her strength, and died on the 10th day after admission.

### A SEVERE CASE OF SCRUB TYPHUS

By C. C. KAPILA

CAPTAIN, I.M.S.

Civil Surgeon, Bhamo

and

G. C. MAITRA

MAJOR, I.M.S.

Director, Pasteur Institute, Rangoon

Mrs. E., aged 30, came under the observation of one of us (C. C. K.) on 29th September, 1936. She complained of a boil on the left side of her neck near the hair margin, and sore throat. On examination it was found that it was a cervical gland which was inflamed and tender. There was also general adenitis of cervical, axillary and inguinal regions. No superficial ulceration of the skin or the scalp was present nor was any lymphangitis detected anywhere on the body. Throat and eyes were congested and the spleen was just palpable and slightly tender. Temperature was normal. Pulse 72 per minute, regular and of good volume. The patient, however, stated that for two days previously she had felt indisposed and that her temperature on the 28th was 100°F. Blood examination did not reveal any malarial parasites. Total white blood corpuscles 5,000 per c.mm., polymorphonuclears 78 per cent and lymphocytes 22 per cent. No abnormal white cells were present.

From 30th September the temperature began to rise in a step-ladder fashion till it reached a maximum of 103°F. in the second week. This was maintained with very slight diurnal variation for four days and in the third week it came down gradually by lysis till it touched normal on 22nd October. The temperature was therefore like that of a *B. typhosus* infection. The rise of pulse rate however was proportionate to the height of temperature. On 4th October an erythematous rash was noticed on the back of both wrists. It disappeared on pressure and was irregular in type and size. In the next few days it had had spread on the forearm, neck and body. No petechiae, papules, vesicles or pustules were noticed. From 6th October the rash began to disappear in the order it had appeared leaving a dusky stain. No desquamation was seen. By the 13th all the rash had disappeared.

During the second and third week the patient was very ill with marked photophobia, intensely congested eyes and throat, and dry cracked tongue. There was slight bronchitis present but never any consolidation. Patient was drowsy and incontinent and tympanitis was troublesome. A second blood examination on 14th October showed white cells 7,000 per c.mm., polymorphonuclears 70 per cent and lymphocytes 30 per cent. Urine showed a trace of albumin.

Blood serum was sent to the Pasteur Institute, Rangoon, on 9th and 15th October for the Weil-Felix reaction and the result showed agglutination with proteus 'O' XK.

By 20th October all the adenitis had disappeared and patient left the hospital on 2nd November after an uninterrupted convalescence.

Treatment was symptomatic.

#### Comment

1. A severe case of scrub typhus running a course of fever like *B. typhosus* infection is described.

references, no such cases appear to have been recorded. (b) The utter failure of phage treatment although started at the outset. (c) Special attention must be paid to the oral hygiene in all cases of acute infections.

[Note.—Kala-azar does not appear to have been excluded in this case.—EDITOR, I. M. G.]

## PRONTOSIL IN ACUTE RHEUMATIC POLYARTHRITIS

By J. N. GHOSH, L.M.F.

*Gurup, Hooghly*

Mrs. M., Hindu female, aged 22 years, four para, was delivered of a child on the 15th February, 1937. Placenta did not come out within an hour of the birth, so it was removed manually by the village *dai*. It was not adherent but was retained mainly in the vagina.

She developed fever on the fourth day after delivery. Uterus was tender, temperature 101°F. and pulse 124 per minute. She was put on quinine and ergot mixture and was watched. On the seventh day the maximum temperature was 102°F. and pulse 120. Lochia was normal. There was no pelvic pain. Uterine involution was normal. An injection of quinine 10 grains was given intramuscularly and was repeated on the tenth day. A simple alkaline mixture was prescribed. Fever continued. Bowels moved once a day.

On the 1st March, i.e., fourteenth day of illness, the left knee joint was acutely inflamed and very painful and then gradually all the joints were affected. Temperature varied from 102°F. to 103°F. with a pulse rate of 140. Bowels moved once a day; tongue was coated. Patient complained of palpitation and pain all over the body. She could not move.

On the 3rd evening Dr. N. C. Ghosh of Chakdighi was consulted, who diagnosed the condition as acute streptococcal infection and advised the following line of treatment:—(i) Prontosil (Bayer's) 5 c.cm. intramuscularly, every day for three consecutive days, and then prontosil tablets three times a day for five days; (ii) digoxin—three tablets a day; (iii) salicylate mixture (20 grains with Peacock's bromide 1 dram thrice daily), and (iv) milk diet with glucose D (Glaxo).

Within twelve hours after the first injection of prontosil, the temperature came down to normal and the pulse to 120. The temperature did not rise again. Joint pains became less and subsided altogether after the third injection. Pulse came down to 96.

On the 12th the patient was much better. Pulse was 86. Digoxin and the mixture were continued one dose a day for a week.

She was examined again on the 20th March. Pulse had come down to 80. She was allowed her normal diet and was put on jeculin (Upjohn's). She is quite all right now.

I publish this case to draw the attention of other practitioners to the remarkable effect of prontosil in this case.

[Note.—The mixture (salicylates and bromides) might have also played some part in relieving the patient's symptoms.—EDITOR, I. M. G.]

## A CASE OF LEAD ENCEPHALOPATHY

By MIN SEIN, M.B. (Cal.), M.R.C.P. (Lond.)  
CAPTAIN, I.M.S.

*Civil Surgeon, Toungoo, Burma*

THE following case is perhaps worthy of record for its many interesting features:—

R. R., an Indian Sepoy, aged 27 years, was admitted into the Indian Wing on 20th July, 1933, on account of sudden blindness of both eyes. On 18th July he suffered from mild but persistent pain in both eyeballs. Vision was good and he played football the same evening.

Next morning there was no pain and he did his normal duties. Towards the afternoon the pain recurred and he discovered that his eyesight had become weak. His dinner had to be brought to him by a comrade. He went to bed in that condition and on waking at about 3 a.m. found his vision had completely failed. His sole complaints on admission were loss of vision and pain in both eyes and over the right eyebrow, described as a mild aching pain.

He had seven years' service with a clean medical history sheet. He had no vaccination or inoculation since November 1932. He was feeling fit till the onset of the present illness. There was no history of venereal disease. He was a total abstainer, not addicted to any drug, and smoked sparingly. For about five months previous to admission he had been an assistant to the armourer and had been working with nitric and other acids.

*Physical examination.*—The patient's general condition was good. He had a peculiar staring expression. There was nothing abnormal in his general behaviour, speech, and mental condition. Vision was restricted to appreciation of strong light. The pupils were markedly dilated, the right more than the left, and were regular in outline. They reacted very sluggishly to strong light and even this was not sustained. There was no sign of inflammation of the conjunctivæ and the uveal tract. Ocular movements were free and there was no nystagmus. Ophthalmoscopic examination revealed marked papilloedema. The arteries appeared normal and there was no hæmorrhage or peri-vascular infiltration. All the other cranial nerves were normal. Sensation, motor power and sphincter control were normal. Ankle and knee jerks were elicited with great difficulty. There was no plantar response. Abdominal reflex was absent on the left side and feeble on the right lower quadrant. The gait was slow and uncertain as the patient had to feel his way about.

The patient was kept under observation in bed and given a bromide mixture. At about 6 p.m. the temperature was 103°F. and pulse 88 per minute. He had no complaint except the pain in the eyes. At 9 p.m. he vomited twice after a drink of soda water. When I saw him soon after this he complained of frontal and occipital headache. The neck appeared to be a little stiff and flexion caused an increase of headache. Passive and active movements of limbs were normal, Kernig's sign was absent. Abdominal reflex was absent on the left side and feeble on the right. Knee jerks could not be obtained but there was plantar flexor response. Condition of the eyes was the same. At 10 p.m. the temperature was 103.6°F. and pulse was 68 per minute and not very regular. The patient was constipated, so a soap enema was given with good result. Bearing in mind the possibility of an increased intracranial tension the following treatment was given. An enema of 6 ounces of 50 per cent hypertonic magnesium sulphate solution was administered twice during the night. The temperature, pulse and respiration were noted hourly. At midnight Major D. Panton, the medical officer on duty, saw the case with me and suggested the possibility of cerebral malaria and gave an intravenous injection of 6 grains quinine bihydrochloride in 10 ounces of water.

Next day the condition remained unchanged except that the temperature was lower, being steady at about 102°F. Lumbar puncture was done very cautiously but the cerebro-spinal fluid was clear and not under pressure. About 3 c.cm. were withdrawn for examination. A fairly complete laboratory examination was carried out with negative results. Blood pressure was 125/65 mm. Hg. for right upper arm and 115/60 mm. for left upper arm.

On 22nd July the condition remained practically unchanged but the temperature came down to 100°F. and stayed there. On 23rd July the temperature continued to fall; the general condition was better and vision had improved. The patient could distinguish movements of objects before his eyes and also persons at a distance of fifteen feet. The condition of pupils was the same. The temperature came down to normal

on the 24th July and till his discharge never rose again. Vision had improved markedly and the patient could count fingers from a distance of three to four feet. The pupils were smaller, the right being larger than the left, and both reacting to light and accommodation. The right disc had cleared up and the left was still a little full. Field of vision (rough test with moving white object) was good. The patient could not read printed words. From now on the improvement in vision was maintained and the pupils gradually assumed normal size till about 3rd August when the pupils were equal, reacted to light and accommodation and discs were normal and the vision had returned to normal. On the 26th July abdominal reflex was sluggish on the right side and absent on the left. On the 3rd August all reflexes were normal. On the 16th, the patient was sent to Major G. D. Malhoutra, an ophthalmic specialist. He reported that the eyesight, field of vision and fundus were all normal.

The patient was next seen by Major G. M. Fraser, a mental specialist, who found no abnormality in the nervous system.

The patient was under observation since his discharge from hospital but up to date (29th January, 1934) he appeared to be normal.

**Laboratory examinations.**—Blood culture was sterile. Widal reaction and agglutination against *B. melitensis* were negative. Wassermann and Kahn's tests were negative.

Total leucocytes—10,000 per c.mm., polymorphonuclears—62 per cent, lymphocytes—27 per cent, large mononuclears—10 per cent and eosinophils—1 per cent.

There were 10 cells per c.mm. of cerebro-spinal fluid; culture was sterile. Wassermann reaction was negative. Lange's colloidal gold reaction—1,000,000,000. Urine showed no abnormality.

**Comment.**—The above notes of the case were written in January 1934 when I was unable to decide on the aetiology of the condition. Whilst engaged in writing an article on lead poisoning I had occasion to search my notes for likely cases and it dawned upon me that it was likely that what the patient suffered from was an attack of lead encephalopathy with the greatest incidence upon the optic nerves as his duties entailed plumbing, soldering and handling of lead and other metals. The patient was employed for five months as an armourer's assistant. Unfortunately no chemical analysis of the urine was done. The symptoms of headache and double papilloedema with loss of vision made one suspicious of increased intracranial pressure due to cerebral tumour. The other symptoms such as the stiffness of neck, increasing headache, loss of abdominal reflexes with fever made one think of a possible inflammatory lesion. But normal pressure and clear cerebro-spinal fluid without increase of cells which was sterile on culture enabled one to exclude any inflammatory cause or intracranial tumour. According to Bramwell (1931) lead encephalopathy is decidedly uncommon. Bramwell quotes Leggs' figures for 1920-24 as 1.1 per cent in the male and 2.1 per cent in the female cases of lead poisoning. The pathological condition is believed by Aub and others (1909) to be a proliferative meningitis with slight changes in the brain. In the case quoted by Bramwell the symptoms were intense headache, vomiting, double vision, right internal strabismus, swollen

right optic disc, loss of knee jerks and abdominal reflexes. The patient had taken diachylon as an abortifacient. That patient recovered completely.

Considering his occupation one could safely make a diagnosis of lead poisoning in the present case. Whilst the investigations were going on the ophthalmic and mental specialists thought that they could not exclude disseminated sclerosis.

**Summary.**—A case showing neurological symptoms is described. It is presumed from the patient's occupation that the symptoms were due to lead encephalopathy.

I must thank the Officer Commanding, British Military Hospital (Indian Wing), for permission to publish the case.

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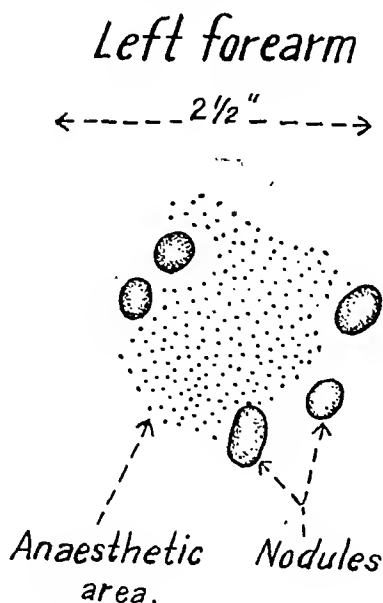
[*Note.*—The author's presumed diagnosis though suggestive is not unequivocal; rapid failure of vision in a young person with quick and complete recovery may be due to disseminated sclerosis, as suggested by the specialists, whereas there is no positive evidence of lead poisoning.—Editor, *I. M. G.*]

#### ORIENTAL SORE SIMULATING LEPROSY

By A. GREVILLE YOUNG, F.R.C.S. (Ed.), D.T.M.

Church of Scotland Mission Hospital, Jalna, Deccan

ON 18th August, 1936, I first saw a Brahmin woman with five nodules on the left arm and three on her right. The nodules were of a purple colour, smooth and about the size of a large pea; and on the left arm the area between the nodules was completely anaesthetic. The dots in the diagram represent the area of anaesthesia.



In view of this, further search was made for signs of leprosy. None being found, a skin clip was taken from the nodule and examined for leprosy bacilli. It was negative. Nevertheless, in view of the fact that

Manson Bahr (in the ninth edition of 'Tropical Disease', page 477) states that no other skin disease shows anæsthesia, it was decided that the case should be labelled as leprosy and treated as such. Alepol was given twice weekly in increasing doses but with no effect. The nodules were then snipped off without the slightest pain on the left side, and only a little on the right. They returned. After three months of alepol treatment the serum from the sore was examined for Leishman-Donovan bodies which were found in large numbers. Four per cent tartar emetic ointment was applied—still no pain—and injections of Fouadin given. The ointment caused the nodules to slough, after which the dressing was changed to one of boracic ointment, and within three weeks the whole trouble cleared up leaving a few whitish scars.

*Comment.*—Oriental sore is common in this area, the north-west part of Hyderabad State, but the patient referred to contracted the disease elsewhere. The majority of cases present small sores with scabs on the arms or face, usually single but occasionally two or three are present. Sometimes they are diffuse and epitheliomatous in type. They resist all ordinary treatment but resolve spontaneously in a year or so. In the above case the sores were of the nature of smooth, purple papules and there was no tendency to break down or to form scabs.

Various treatments have been tried here—applications of 1 to 4 per cent tartar emetic ointment; injections below and into the sore of orisol and emetine; intramuscular injections of Fouadin (Bayer) 2 to 5 c.cm. and intravenous injections of urea stibamine; scraping the sore and applying bland ointment.

The last-named treatment seems as good as any if the patient submits to the small operation. It must be done vigorously, otherwise there is a tendency to return. A scar is left. Of all the injections tried Fouadin seems to be the most useful, but there is no quick response to treatment.

One to two per cent tartar emetic ointment as advocated by Manson Bahr has been entirely useless in our hands. But four per cent strength causes sloughing and if borne for 24 to 48 hours results in a complete cure. The raw area takes a further 15 days or so to heal with bland ointment applications.

It may be asked why a smear for Leishman-Donovan bodies was not taken earlier. It was due to the unusual appearance of the papules and the anæsthesia which misled one into thinking the case was one of leprosy.

## STRANGULATED HERNIA

(TREATED BY RESECTION AND ENTERORRHAPHY).

By SURESH CHANDRA DAS GUPTA, L.M.S. (Cal.),  
M.A.C.P.T. (U. S. A.)

Surgeon-Superintendent, Bir and Town Hospitals,  
Katmandu, Nepal

ABOUT three months ago a patient, aged 27 years, was admitted into the Bir Hospital with

a sloughing ulcer of the right side of the scrotum and faecal incontinence.

*History.*—Just two weeks before the patient had a huge swelling in the inguinal canal stretching up to the scrotum and all the signs of intestinal obstruction, but no medical help was available. On the sixth day the scrotum sloughed and faecal matter began to flow out through the wound. He was brought to the hospital on the fifteenth day after the onset in an extremely emaciated condition. On examination it was found that a portion of the intestine had sloughed and stool was leaking through the proximal end.

*Treatment.*—Although the patient was dressed every four hours, he could not be kept clean. Food that was given by mouth came out through the fistula practically unaltered in a few hours and there was practically no absorption. He was x-rayed; but unfortunately the barium drained out before the expected time so that the radiogram was so indistinct that the seat of rupture could not be determined.

*Operation.*—Initial anæsthesia was induced with chloroform and it was maintained with ether. Saline and glucose were given intravenously. A skin incision was made about five inches in length from the pubic spine to a point about one and a half inches above Poupart's ligament. The fascia and muscles were divided and the bare intestines were brought into view passing through the ring into the scrotum, the hernial sac having sloughed off. An assistant passed two rubber tubes through the open ends of the intestines from below, under the towel without encroaching on the area of operation. It was found that the intestines through which the rubber tubes were felt were of different sizes; one was small intestine and the other colon. So it was evident that the constriction had occurred above the ileo-cæcal valve and the whole cæcum with the appendix had sloughed off. Next, I applied two rubber-covered intestinal clamps just below the internal ring on both small and large intestines, and then divided them below the clamps having the parts carefully guarded with towels in order to avoid contamination with stool. After thorough cleansing with warm saline lotion I united the ilium with colon by end-to-end anastomosis beginning at the mesenteric border and closing and over-sewing the terminal portion of the colon beyond the margin of the ilium and reinforcing the united parts with Lembert's sutures. Next, the mesenteric angle was trimmed and sutured together and finally the sutured intestines were again washed with saline, swabbed with ether and returned to the abdominal cavity. The margins of the peritoneal sac were picked up and closed with a purse-string suture. The opening was reinforced by bringing the conjoined tendon and Poupart's ligament together as usual. Then the two pieces of divided gut lying at the external ring were pulled out and a piece of gauze was inserted there for drainage by the side of the scrotum. The skin of the abdominal wound was sutured, dressed and bandaged, and afterwards the scrotal wound was dressed separately.

*After treatment.*—The foot of the bed was raised about nine inches, and when the patient recovered from shock, he was placed in the Fowler's position. Nothing except sips of sterile water were given by mouth for the first 24 hours, while rectal glucose and saline were given by the drop method. An enema of glycerine was given on the third day, and a soap-and-water enema on the fifth day. Whey and fruit juice were allowed on the same day, and after two more days milk and barley water. Liquid paraffin was administered on the eighth day and rice gruel was given afterwards. On the twelfth day soup and soft rice were given. On the fifteenth day spoon diet was given, which was increased gradually to full diet in ten days. The patient was completely cured and discharged at the end of the fourth week.



# Indian Medical Gazette

JULY

## PROTAMINE ZINC INSULIN

INSULIN is one of the few therapeutic agents that have been received with consistent enthusiasm by the medical profession all over the world. Nevertheless, it has its limitations and one of the obvious difficulties hitherto encountered in the use of insulin in clinical diabetes has been its transient, but sometimes severe, action in causing dangerous oscillations in the blood-sugar level. To overcome this difficulty, a search has been made for a long time to find an insulin compound that would have a slower action, and would produce a more gradual lowering of the blood sugar that would be effective over a prolonged period. This would then simulate the normal action of insulin in our system, *i.e.*, by a regulated and almost continuous secretion from the normal pancreas.

All these considerations have been weighing in the minds of workers in different parts of the world, who have been trying to find a means to retard the rate of absorption of insulin, so that a more-or-less continuous and sustained action could be obtained. Various methods of retarding insulin action, such as by using it in the form of an oily suspension, by injecting insulin with vaso-constrictor substances, and by preparing an insulin compound sparingly soluble in tissue fluids, have been tried without any real success, until last year when Hagedorn and his Danish colleagues introduced to the world a new insulin compound, 'protamine insulin' or 'insulin-retard', which was recognized as having several distinct advantages over the ordinary insulin. This new insulin compound was employed therapeutically in Denmark for some time before it was put on the market as 'Leo-insulin retard'.

The idea behind Hagedorn's discovery was the successful linking of insulin hydrochloride with a basic group—the particular base used being a natural protamine (a simple protein) obtained from fish-sperm. Hagedorn found that when insulin hydrochloride was made to combine with a protamine, which was properly buffered so that the iso-electric zone of the compound was brought near pH 7.2 (*i.e.*, the hydrogen-ion concentration of the tissue fluids), a fine precipitate of insulin protamine formed which was found to be sparingly soluble in tissue fluids. This finely-divided white precipitate was found to contain the active insulin fraction. When the precipitate in suspension is injected subcutaneously it breaks down slowly so that the active insulin is gradually released and absorbed, thereby causing a continuous and prolonged action on blood sugar.

Hagedorn's discovery naturally stimulated an intensive research, and modifications of his original method soon appeared. The more recent modification, which has received confirmation at the hands of many workers, is that introduced by Scott and Fisher working in the Connaught laboratories in the University of Toronto. These workers have shown that the addition of a small percentage of zinc to a protamine-insulin mixture (1 mg. per 500 units) enhances its therapeutic value, as a more definite and prolonged action is produced. Besides, in addition to causing a greatly improved effect, zinc stabilizes the protamine insulin suspension. This new compound has been designated 'protamine zinc insulin'. It has been shown that with one injection of this substance the blood-sugar control is maintained sometimes for over 30 hours, whereas with the other, *i.e.*, 'insulin-retard', the blood-sugar control lasts from 12 to 15 hours only.

It, therefore, appears that protamine zinc insulin owing to its slower and long-continued action has certain advantages over the insulin-retard and certainly many over the ordinary insulin hydrochloride. One of the immediate advantages of the protamine zinc insulin over the ordinary insulin, especially from the point of view of the patient, is the reduction in the number of daily injections. Ordinary insulin with its relatively rapid but transient action, lasting for about 6 hours or so, requires to be given repeatedly in severe cases of diabetes in order to produce an effective control over the blood sugar throughout the day. Protamine zinc insulin, on account of its less rapid but more persistent and continuous action, is better able to prevent the hyperglycemia for much longer periods and thus to effect a much better control over the blood-sugar level, often without a repetition of the dose. This is a great advantage to severe diabetics, who have to be awakened during the night to get their dose of insulin in order to prevent the early-morning hyperglycemia, for, as is generally known, in severe cases of diabetes, a fairly marked hyperglycemia usually occurs during the early hours of the morning and a dose of ordinary insulin given in the evening is insufficient to keep the blood sugar down during the long interval of 10 to 12 hours during sleep. Protamine zinc insulin on account of its long-continued slow action is better able to keep the blood sugar under control during the night and to reduce the early-morning hyperglycemia.

When a dose of protamine zinc insulin is injected subcutaneously the blood sugar usually shows no changes till after four hours, when it begins to fall. The rate of fall of blood sugar, though much slower than when ordinary insulin is given, continues, and, if the food intake is restricted, a maximum fall is usually obtained 12 to 16 hours after the injection and symptoms



of hypoglycæmia begin to appear. The hypoglycæmia is however more subtle in onset and the subjective symptoms are less severe than with ordinary insulin, the usual early symptoms such as tremulousness, sweating, palpitation, etc., may be quite unnoticed by the patient, even when the blood sugar is as low as 60 mg. per 100 c.cm. Thereafter, the blood sugar rises slowly but does not usually attain the pre-insulin level till about 24 to 36 hours after the injection.

The early symptoms of the hypoglycæmia following the administration of protamine zinc insulin being thus unnoticed, the patient may get a false sense of security, but on account of the persistent and continuous insulin action he may pass into the severe hypoglycæmia without warning, even when he is under observation. This, certainly, is a disadvantage in the use of protamine zinc insulin as distinct from ordinary insulin, the hypoglycæmia of which occurs with almost clock-like regularity and with specific symptoms.

Another difficulty that arises with protamine zinc insulin is the uncertainty of its summation or cumulative effect on account of its action lasting sometimes over 36 hours. Even when the patient receives one injection daily, the residual effect of insulin given on the previous day combining with that of the fresh dose will tend to enhance its action and the continuance of the same large dose for an indefinite period is likely to produce undesirable results.

Then again, on account of its slow absorption and action protamine zinc insulin will not effectively control the rapidly-increasing hyperglycæmia as in the threatened coma of severe cases, or following a high carbohydrate diet in the ordinary case. In such cases the physician, if he relies on the drug alone, is likely to find himself involved in the error of giving

either large or repeated doses in his effort to reduce the blood sugar quickly. This, as previously mentioned, will produce a cumulative effect with serious consequences, particularly in advanced heart cases, due to the continuance of the hypoglycæmic reactions.

The question naturally arises as to what should at present be the exact place of protamine zinc insulin in the treatment of diabetes. So far as we can see, this is still uncertain and to estimate the real value of protamine zinc insulin in diabetic therapy much more clinical and laboratory experience has to be gained.

When a new therapeutic agent is introduced the greatest danger to which it is subjected is from over-enthusiastic advocates who are liable to use it to the exclusion of other tried and established therapeutic agents, without first ascertaining its scope and limitations. Some of the recent reports in the literature on protamine zinc insulin have been disappointing and there is no doubt that the ordinary insulin will for some time retain a very important place in the treatment of diabetes.

It is recognized, however, by most workers that the new preparation, protamine zinc insulin, has many advantages over the ordinary insulin and it seems likely that this new discovery will change the outlook of the diabetic patient, directly, by causing an immediate improvement in the treatment of clinical diabetes, especially of the severe type, and, indirectly, by opening up a new and promising line of research. Incidentally, it appears possible that this work will also stimulate further research in the mode of preparation of other hormonal products in such a way as to make their action slower, continuous, and more physiological, and therefore of much greater value as therapeutical agents.

J. P. B.

## Special Articles

### DIET AND PUBLIC HEALTH IN INDIA\*

By H. E. C. WILSON, M.B., Ch.B., D.Sc.

*Professor of Biochemistry and Nutrition, All-India Institute of Hygiene and Public Health, Calcutta*

THE function of food according to our textbooks is to supply material both for the wear and tear of tissues and the promotion of growth in the young. This definition I consider to be a minimum; to say the least, the rate of growth may be subnormal and even with a constant body-weight wear and tear may not be adequately covered. In the end it comes down to the maintenance of health; again a term often

inadequately defined as a mere freedom from disease. To appreciate exactly what nutrition has to subserve one has to visualize the physiological economy of the organism. Biology teaches us that every function of the body is kept going at its particular level of activity primarily by the amount of use or disuse to which it is subjected. Our physiological mechanism carries, as far as the young are concerned, no large immobile reserves or one might call it no frozen credits. A certain reserve there is, although this is more apparent than real. Observation shows that, for instance, under normal conditions only a certain percentage of the tubules of the kidney are functioning at any one time. This small fraction

\* A paper read at the Public Health Society, Calcutta, on the 21st April, 1937.

however is always changing all units which must ultimately go into activity. The same holds good in the nervous system and the muscle fibres, all of which under certain conditions obey the law of fluctuation. In short, all functional units are kept up to the mark. Should the food intake be altered in quantity or quality, certain physiological activities may be reduced, or, if it is qualitatively changed, hypertrophy may follow. In certain vitamin deficiencies, for instance, there tends to be a diminished activity of the alimentary system with a hypertrophy of such glands as the suprarenals. The dietetic treatment of disease is an example of the application of this principle; a low protein diet in nephritis, for example, eases the work of the renal tubules the number of which is either reduced or their capacity somewhat diminished. In diabetes, on the other hand, in our endeavour to save the carbohydrate oxidising mechanism we run the risk of straining that concerned in the metabolism of fat.

The physiological economy of the organism, however, is something more than a series of functional units each on its own and with its own mobile reserve. The co-ordination of the various functions, their integration into a unit is perhaps the main feature characteristic of an intact living organism. How often does one see patients who show symptoms of disease due to inco-ordination between different systems of the body even within one system itself. A common faint is probably due to a temporary lack of co-ordination between different parts of the body in their demands for blood. A rapidly-emptying stomach or a sluggish overloaded large bowel are other examples. For normal physiological economy, then, a balance between the activities of the different systems is required—an integrative action. Within recent years we have witnessed the increasing rôle attributed to the brain in this respect. Respiration, kidney secretion, blood pressure, heat regulation, the activity of the alimentary canal, etc., all seem to be co-ordinated by nerve centres. Further, modern research shows that the leader of the endocrine glands, namely the pituitary, is placed in the brain. Integration and balance, these then appear to me to be cardinal features of health. Again, it is difficult to define in concrete terms, but its absence is quickly noted and the phrase a balanced mind suggests a lot.

This brings us to the question as to how far can environment, and food as a particular example, influence this particular activity. That one expects as much from food in these days is witnessed by the phrase a balanced diet, that is, one that will keep the machinery of the body running smoothly, i.e., in co-ordination. These then are some of the considerations which one must keep in mind when thinking of the influence of food on the organism. Ideas however must be expressed in practical terms and so far

as India is concerned the question in the broad sense is ultimately—are the people properly fed?

An attempt to answer this question may be given by a study of the quantity and quality of the food consumed. The data so obtained may then be compared with other diets and categorically condemned as inadequate, quite oblivious of the fact that the living machine has a capacity for healthy adaptation to diets quite unlike that which may be claimed as a standard. More practical information may however be obtained by making a medical survey of the people, observing their growth according to height and weight, the incidence of rickets, anæmia, oral stomatitis, toad skin, bleeding gums, etc. In short, recording the incidence of conditions which are known to be associated with a defective diet. Height and weight studies alone are very useful guides as to health in general, but again it may be misleading in certain cases. A healthy individual should have a due proportion or relation between soft tissues on the one hand and skeleton on the other. These then are some of the methods, namely food analysis, diet and physical surveys, which are being employed just now in order to ascertain the degree and nature of malnutrition in so far as it exists locally or generally in India. There is I think great scope for medical men in the mofussil for making careful observations in this direction. Those already employed in this field of work are few and in the beginning will be able to bring out only the broad outlines. The practical question may then be asked, given this information what will be done? To improve the diet obviously—but could not this be effected without all this preliminary work? This is indeed true, but it would certainly be expensive and the return in health might be disproportionately small in relation to the cost. It should be pointed out that under present economic conditions any immediate improvement in diet must not cost much, hence it is the problem of the nutrition experts to decide what is the most marked deficiency and along with the agriculturalists to suggest what is the most economical way in which it could be met. The result would in all probability be by no means an adequate diet, but in the field of nutrition it is probably a truth to say that a first small essential addition to an otherwise poor diet brings about relatively greater improvement in health than the later additions which bring it up to an optimum level. The law of diminishing returns appears to hold good in physiological as well as in commercial economy. At present in India we lack adequate statistics of height, weight and other skeletal measurements. Is one to take the average of the population of India as a whole or of any one area? Would the average be the ideal to be aimed at? I should like to point out that there is evidence that the mean stature of many nationalities in Europe has been increasing slowly over a period of years.

The following table quoted by the *British Medical Journal*, from Prof. Bowles of Howard, illustrates this trend :—

probable in regard to athletic contests which, be it noted, demand a fine co-ordination of mind and muscle. The aim of a broad public health

*The average height of recruits in centimetres*

NORWAY		SWEDEN		DENMARK	
Year		Year		Year	
1878-1887	.. 168.80	1846-1850	.. 167.40	1852-1856	.. 165.42
1898-1902	.. 170.39	1887-1890	.. 169.20	1879-1888	.. 167.78
1923-1925	.. 171.81	1901-1905	.. 170.80	1904-1905	.. 169.11
		1921-1922	.. 171.90		
Increase	.. 3.01 cm.	Increase	.. 4.5 cm.	Increase	.. 3.69 cm.

HOLLAND		SWITZERLAND		ITALY	
Year		Year		Year	
1863-1867	.. 164.10	1792-1799	.. 155.50	1855-1859	.. 162.4
1883-1887	.. 165.60	1831-1840	.. 159.70	1867	.. 163.4
1898-1907	.. 166.80	1851-1860	.. 163.00	1896	.. 164.5
1921-1925	.. 170.77	1861-1872	.. 165.00		
Increase	.. 6.67 cm.	Increase	.. 9.5 cm.	Increase	.. 2.1 cm.

The increase in height ranges from about 0.05 to 0.1 cm. per year. Similar observations have been carried out in Japan and the United States. In America, for instance, they compared the heights of students at Harvard University whose parents had also been measured there many years before. They found that for males the average increase in height in one generation was  $3\frac{1}{2}$  cm. and for females an increase of 3.1 cm. Corresponding increases in weight were also noted. They observed, however, that the general body build had become somewhat slimmer, especially in women in regard to the hips. The writer, Professor G. Y. Bowles, attributes the change primarily to environmental influences including diet, general hygiene and increased indulgence in sport. We have also at hand some interesting indirect information with regard to conditions in the Middle Ages. Observers at Home have found that the average man is not able to get into a suit of mediæval armour or even one of much later date. When we keep in mind that many of those who could afford a good coat of mail must have been in relatively affluent circumstances, and hence well fed, one doubts whether environmental influences alone have been playing a part over the centuries. Moreover these men, according to history, were by no means weak as far as feats of physical strength were concerned. In this connection I should like, however, to make a comment on the exaggeration by which the past is often magnified in our eyes. I have read somewhere, to be exact in a book called 'Hellas Revisited' by Prof. Dixon, a statement that the feats of the Greeks in the Olympic games were probably by no means up to the standards of to-day. This however was an opinion and, as comparisons are odious, we must at least grant them their laurels as being the record breakers of their day. These few observations however should remind us that we should not accept the present standard as an end in themselves. In general the evidence appears to favour the idea that physically man is superior to his forbears and certainly this is

and eugenic policy should be to aid the biological and evolutionary forces in the attainment of a receding on rather advancing ideal. This however is a far cry but it is as well to keep in mind the existence and idea of progress. I should like to point out that the historian, Professor Bury, has shown that the explicit concept of progress in history is of comparatively recent date, at most 150 years, and the conscious realization that there is such a process must alter the mind and outlook of a generation which would be different from those of a more static outlook.

The gradual disappearance of the conception of *laissez-faire*, i.e., outside the direct conscious control of man as an historical and certainly as an economic hypothesis, is a case which illustrates the change in outlook. This however is a long way off and we have to be content at the present with the modest but practical observation in Europe of the gradual disappearance of rickets and the increased growth and height in children receiving supplements of milk to their diets. These facts alone may constitute a basis for an immediate policy where it can be afforded in regard to the improvement of diet and hence of health. Within recent years, however, it has been realized that height and weight alone do not necessarily constitute a criterion of adequate nutrition, and/or of health. As was mentioned above a normal healthy individual is one in whom the various physiological functions are co-ordinated or in balanced equilibrium. Such an individual should be well formed physically, i.e., should preserve a due proportion between height and weight, between skeletal measurements on the one hand and soft tissues such as muscle and fat on the other. On such a basis along with clinical observations was the arm, chest and hip index of nutrition worked out in the U. S. A. A number of medical men gave their clinical assessment of children in relation to their general appearance, chest development, amount of fat, muscle, etc., and at the same time a number of physical measurements

were made. On such a basis it was found that there was a relatively good correlation between clinical assessment and certain physical measurements, namely, the relationship between arm, chest and hips figures. The method has been tested here in Calcutta at the Institute of Public Health, in the Punjab by one of our staff and in South India by Dr. Aykroyd. Dr. Aykroyd found that of 100 children all showing certain clinical signs of deficiency disease the index would have selected 63.8 per cent, *i.e.*, as being unfit. Dr. Ahmad of this Institute observed on an average that the index selected about 5.6 per cent of all Punjab Hindus, while of those picked out by inspection to be of poor physique the index figure was 28.7 per cent, a much poorer one than that obtained by Aykroyd. In Calcutta there appeared to be no correlation whatsoever. Children of the poorer classes, whose heights and weights were considerably below the better-off ones and had a higher incidence of carious teeth and enlarged tonsils, were not selected by the index. Other tests of a more physiological or functional type such as a grip with a dynamometer are being tried out and should be of value as they give an index of actual performance. All these methods may yet fail to give a true picture of what a sound body is but their use at least should show up differences between areas or races which can be correlated with one or more environmental factors including diet.

### *Food of India*

In discussing the problem of diet in India, so different in many ways from that in Europe, it is well to inquire how far nature has provided food suitable for the inhabitants and how far the inhabitants adapted themselves to what the land produces. The prevailing diet of the masses is largely vegetarian and the staple cereals are rice and wheat. Unfortunately those two cereals do not grow side by side all over India and are hence, certainly as far as wheat is concerned, not within the means of all living in those areas where it is not grown. In general, wheat and rice are consumed in the particular regions in which they are cultivated. What are the relative merits of these two cereals? In general, rice is poorer than wheat in protein, fat and minerals, particularly calcium and phosphorus. The vitamin-B<sub>1</sub> content is probably low in the natural unmilled state and most certainly so in the polished condition. Let us look, however, at the general texture of a diet of those cereals as they are actually consumed. Rice when ready for consumption is much bulkier and contains more water than an equal caloric quantity of atta which is often taken in a relatively dry condition as *chapatti*. The whole process of digestion with rice probably involves a greater burden, certainly as regards bulk, on the alimentary canals. Rice stools, moreover, are usually moister than the usual formed stools. This

greater water content may not be disadvantageous in preventing a certain amount of constipation although it is notorious that this condition is common among rice-eating peoples. The greater water content of the stools should favour bacterial decomposition in the bowel but in a healthy individual on a vegetarian diet I did not find indirect evidence for such a condition. The experiments which were carried out here were done with a view to finding out whether the composition of the urine on a rice and atta diet could give any information on the tendency to calculus formation in the wheat-eating areas. The following points were noted. The volume of urine on a rice diet was almost double that on an atta one. The salt excretion was also very much increased presumably because rice requires much more of this condiment to make it palatable. I was inclined to attribute the extra volume of urine partly to the additional water which rice contains and partly to the diuretic action of the salt. On looking through the literature, however, it was found that McCay in Calcutta over twenty years ago had observed the same phenomenon and had adduced a certain amount of evidence to show that salt alone was not the only factor. The excretion of oxalic acid was found to be greater on an atta diet as was also the calcium and phosphorus input in the urine. No difference was observed either in the uric acid excretion or in the output of ethereal sulphates which is often considered as an index of bacterial decomposition in the bowel. It would appear then that on an atta diet the volume of urine is less; it is more concentrated and contains more oxalates, phosphates and calcium, conditions favourable to the development of calculi. Further, on a rice diet the tissues probably carry a greater reserve of fluid, a condition which would be advantageous in a tropical climate where the demands for fluid lost by insensible perspiration are greater. Rice then appears to be a foodstuff not entirely unsuited to the climate in which it grows. The fact remains however that the rice-eating peoples are in general of poorer physique than those who consume atta as a staple diet. This can not however be attributed to rice alone. The climate in rice-growing areas is more enervating and the supply of fats and animal protein becomes also less, the nearer we approach the equator.

### *The problem of a vegetarian and meat diet*

It has been pointed out that, in several areas of the world those who consume a high-protein diet are of finer physique and are more virile than the others of the same race who for one reason or another consume less protein. It has been pointed out, for instance, that in the north of Italy where the protein consumption is higher the physique is better than in the south. The same statement has been made

about India, although here racial differences may play a part. It is a moot point, however, whether they are virile because they consume a high-protein diet or whether the virile types choose flesh as a diet *par excellence*. I am rather inclined to favour the latter view; the desire for animal food must undoubtedly have demanded and stimulated the development of an active brain and supple muscle in order to catch their prey. This however might imply that the vegetarian is lacking in initiative and mental alertness. It is indeed possible that the primitive man of action became a hunter and flesh eater while the more contemplative type by steady observation and regular labour developed an agricultural economy with conditions favourable to the growth of a literature, science and mythology. In view of the fact however that man's dental structure and alimentary canal appear to be suited for a mixed diet and in view of the fact that many lead a healthy and mentally-productive life on a diet which contains milk as the only source of animal food, we may say that the types of diet like the types of man cannot be laid down in rigid terms. Altogether it is likely that man within limits is as adaptable to diet as to other environmental influences.

I should like to discuss one point which some may raise in relation to the population of India. The population is increasing; hence one might argue there cannot be any serious defect in nutrition where such a state of affairs exists. It should be noted, however, that this condition is effected by a relatively high birth in relation to Europe and a more-or-less equally high death rate. There exists a quick turnover in population, the expectation of life is short and the mean age of the population is, one may say, young. The prevailing ideal in European countries is a relatively long life, the three score years and ten. It is well however sometimes to consider India without comparison and look to the advantages obtained from a young population. Such a people should be more prone to accepting new ideas and the promotion of progress. Considering the fact that India is primarily an agricultural country and that agriculturists are all the world over of a more conservative nature than the relative youth of India may for the time being be no disadvantage.

These then are some of the considerations which one likes to keep in view when considering problems and their solution for the betterment of India. I consider it of importance not only to find out the flaws and deficiencies in diet or other environmental factors, which, be it noted, are often the outcome of only partially justifiable comparisons from outside, but also to observe with the eye and the outlook of a Darwin and a Wallace, how far and by what means nature and man in particular in India is adapted to his surrounding. In no field is this

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## A PLEA FOR A FORWARD PUBLIC-HEALTH POLICY IN INDIA\*

By K. C. K. E. RAJA, L.R.C.P. & S., D.P.H., D.T.M. & H.  
*Officiating Professor of Vital Statistics and Epidemiology, All-India Institute of Hygiene and Public Health, Calcutta*

INDIA is on the threshold of great changes. The past sixteen years have seen a greater advance in self-government in the country than during the whole previous period of British occupation. The Government of India Act of 1935 has inaugurated a further transference of power to the people. It is therefore proposed to take stock of what has already been accomplished in the field of public-health administration and to indicate briefly certain lines of advance which seem to be essential if the increased measure of self-determination granted to India is to be accompanied by a sound public-health policy for the country.

There are at least three great landmarks in the history of public-health administration in India :—

I. The appointment of a Royal Commission to enquire into the health of the army in India in 1859.

II. The report of the Plague Commission in 1904 following the outbreak of plague in 1896.

III. The Reforms introduced by the Government of India Act of 1919.

The Royal Commission of 1859 was appointed because the conditions of health in the army were extremely unsatisfactory. Between 1859 and 1863, the mortality among European troops was 69 per 1,000 and among European women in 'married quarters' the death rate varied from 44 to 276 per 1,000 (King, 1923). The Royal Commission recommended measures not only for the army but also for the civilian population. According to its suggestion 'Commissions of Public Health' were formed in Madras, Bombay and Bengal in 1864. The Commissions in Madras and Bengal advocated far-reaching measures, including the employment of trained

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\* A paper read at the Public Health Society, Calcutta, on the 21st May, 1937.

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of more importance than in regard to food and nutrition. Surely nature did not design man in such a way that his physiological economy cannot be brought to its maximum efficiency on the foods grown on the soil in which he lives. Nature has been at work much longer than research laboratories and it is the obvious duty in our schemes for improvement to further the favourable processes already in existence rather than import, without due modification, alien ideas the assimilation of which must of necessity be difficult and perhaps not in harmony with the evolutionary trend in India at the moment.



public-health staffs in the districts. But during this period the position was difficult and no definite policy was laid down. In the words of a former Sanitary Commissioner with the Government of India, 'Government had to deal with a population which was unwilling and unready to receive sanitation, which either frankly disbelieved in its efficacy and resented any change in established customs or was too ignorant and apathetic to understand the goal at which it aimed. Sanitary measures were received not by indifference only but by active opposition' (quoted by Graham, 1928). Under the circumstances, very little advance was possible but the outbreak of plague in 1896 produced a profound effect which may perhaps be described in the words of the Sanitary Commissioner at that time :—

'When plague appeared it was not a new disease, but it was new to the present generation of Indians and it has exacted a very heavy toll of deaths all over the country. The strangeness of the disease, the unpopularity of the measures taken to control it and the importance of these measures have served to rouse the people from their apathy and concentrate the attention of all, but especially of the educated classes, on sanitation in a way that nothing else could have done'.

'At the same time plague has not been without its effects on Government. Previous to the advent of this disease it had been the generally accepted opinion that sanitation was the work of any medical officer and required no special training. A special sanitary staff had therefore not been considered of any very great importance. When plague appeared the staff was inadequate and unprepared; action was taken on general principles and sanitary measures were adopted, which, with further study of the aetiology, we now know were unsuitable and could do little to check the spread of the disease. The waste of life, time, money and effort that resulted has impressed on Government the necessity of being prepared in future and large changes have been effected with that object' (quoted by Graham, 1928).

The report of the Plague Commission in 1904 advocated the reconstruction of the sanitary department on a wide imperial basis, with the establishment of adequate laboratory accommodation for research, teaching and sera and vaccine production. The Indian Research Fund Association was formed in 1911 and a forward sanitary policy, with devolution of powers to the local governments, was formulated in a resolution of the Government of India in 1914.

The Reforms of 1919 had a marked effect on public-health administration, which was partly beneficial and partly detrimental. Ministers responsible to the legislature were anxious to hasten the growth of education, medical relief and sanitation as far as funds permitted. The organization of trained public-health staffs for

urban and rural areas, which the 'Commissions of Public Health' had recommended in the sixties of the last century, was at last taken up in earnest and, in the years succeeding the introduction of the Montague-Chelmsford Reforms, the organization of health services was a feature in most provinces. Since 1921 there has indeed been far greater public-health activity in the provinces than ever before.

To this brief review of the development of public-health services in India must be added the statement that, in the earlier period, emphasis was always laid on the provision of medical aid to the people rather than on prevention of disease. In consequence, the meagre sanitary services received throughout step-motherly treatment, as pointed out by King (1923), and were made subordinate to the head of the civil medical department in each province. During recent years, which have seen a comparatively rapid expansion in the public-health services, the tendency has been for the curative and preventive aspects of medical service to function in water-tight separate compartments. This is unfortunate. The two are, in fact, complementary to each other. Adequate provision for treatment forms an important part of any programme of prevention for most of the common infectious diseases, including such social evils as venereal diseases and tuberculosis. At the same time, disease is, from the standpoint of the community, a social problem and not merely one of relief or cure for the afflicted individual, which is, unfortunately, the angle of vision too often adopted by the general practitioner. It is essential that medical practice should, at every stage, be permeated by the idea of prevention. The harmonizing of the claims of the two branches of medical service in the interests of the community can best be secured by co-ordinating the activities of both under one administrative head. I shall deal with this question further at a later stage.

Although the Reforms of 1919 gave a stimulus to the expansion of public services in India, at the same time, certain factors contributed to a fall in the efficiency of local self-government in the country. As far back as 1888, the Government of India decided that sanitation should form one of the important duties of the newly-constituted local bodies. The sections relating to the administration of these bodies in the report of the Indian Statutory Commission (1930) form an illuminating study. In accordance with the recommendation of the Montague-Chelmsford report, the local bodies were given the largest measure of independence from outside control. The Statutory Commission stated: 'The result of the legislative and administrative action taken in accordance with the scheme of the Reforms was, in effect, to deprive the new ministers of local self-government of powers which were essential if they were to perform their tasks successfully. We have heard the



criticism that the only effective powers possessed by provincial governments, namely those of suspension and dissolution, have left the ministers powerless in the face of misconduct calling for less drastic treatment, and we think that the criticism is well founded'.

Further, the present system of local self-government makes, in most provinces, the elected chairman responsible for administration and the fact that he has periodically to seek election at the hands of the electorate interferes with the effective and fearless discharge of his executive functions. In consequence efficiency has suffered. The Statutory Commissioners remarked :—

'It is not realized how much the efficiency of local self-government in England depends on the existence of a class of skilled professional administrators who, while they follow the policy laid down by the elected representatives, are at once their advisors and the instruments whereby their decisions are put into operation. In this sphere, as in others, we have noticed a tendency to misapprehend what are the duties and functions of elected members. There is on the part of elected persons a general tendency to meddle and interfere in the details of administration which should be left entirely to the paid official'.

The fall of efficiency is noticeable in a failure to enforce the powers that have been conferred on local authorities, which results in grave dereliction of duties in regard to public health. We shall return to this question when we consider the manner in which improvement of the present position can be effected.

Under the Montague-Chelmsford Reforms public health was made a provincial subject. The powers of the Government of India and of the Central Legislature appear to be confined to legislation relating to infectious and contagious diseases, census and statistics, pilgrimages beyond India, sanitary control of ports and India's international health relations. The new Government of India Act of 1935 has more or less maintained this position. The Federal Legislature has no power to legislate on 'public health and sanitation, hospitals and dispensaries, etc.', except in so far as these subjects are of common importance to the several units constituting the federation. The general provision has been made that, in regard to all provincial subjects, the Central Legislature can legislate on all aspects in which inter-provincial interests emerge.

Any proposals for a forward policy in public-health administration must take note of the constitutional demarcations that have been imposed. The broad principle was accepted about seventeen years ago and re-emphasized in 1935 that the development of public health should be mainly a function of the provinces and that the activity of the Central Government should be confined to co-ordination of

inter-provincial activities and the management of India's international health relations. The latest advance in India's political development has a deeper meaning than the Reforms of 1919 in that, at no very distant date perhaps, the federation of British and Indian India will make for the functioning of the country as one unit which, from the standpoint of public-health administration, will be of advantage.

In addition to the necessity of unifying or co-ordinating the medical and public-health services, the two main defects of the situation are (1) the absence of a co-ordinating agency at the centre by which greater uniformity of development in the different provinces can be attained and (2) the inefficiency of the local bodies, which are primarily responsible for public-health administration. In regard to the second defect, the report of the Statutory Commission indicated defects in the machinery for local government as well as in that of the controlling authorities, the provincial governments. Local self-government and public health are, under the coming Reforms, subjects for provincial legislation but, as has been pointed out, the centre can step in if legislation applicable to all parts of India is under contemplation.

In order to correct these defects a Federal Ministry of Health and an All-India Public Health Act seem to be essential. A Federal Ministry of Health would form the co-ordinating agency for the provincial local self-government departments, which are at present responsible for the supervision of local bodies and for public-health administration in the provinces. This Ministry would also be responsible for the other health functions statutorily conferred on the Central Government by the Government of India Act of 1935. For these purposes, the Ministry should have a highly trained staff of expert advisors. At present the Public Health Commissioner, who corresponds to the Chief Medical Officer of the Ministry of Health in England, has no specialists on his staff. On the other hand, in England the Chief Medical Officer has a strong team of workers in each of the bureaux of public-health work, such as maternity and child welfare, epidemiology, industrial hygiene and so on. In India the conditions are much more complex than in England, where public-health administration has established itself on well-regulated lines, but even now the task is left to a single individual although the necessity for an expansion of the Central Government's technical staff has been repeatedly stressed by successive Public Health Commissioners.

The provision of a suitable staff of experts must devolve on the Federal Government and cannot be relegated to the provinces. A Royal Commission on Health in Australia (1925) emphasized that, as 'the success of health administration is more dependent on the personality and capability of the officers directing

it than on any other single factor', the Commonwealth Government should be responsible for the maintenance of highly trained experts 'to advise and help local authorities when desired by State Health Administrations'. If such an arrangement suits Australia, a similar plan should be equally successful in India. Moreover, a carefully selected central staff should to some extent suffice to avoid duplication of posts of highly specialized men in the component states of the Federation, while the position and prestige of the Federal Administration would enable it to attract the proper type of men.

In order to illustrate what the functions of a Federal Public Health Service are, a brief description of the Federal Health Service of the United States of America may be given. There are eight administrative divisions working under the direction of a Surgeon-General.\*

#### 1. *Division of marine hospitals and relief*

This controls the treatment and examination of about 400,000 merchant seamen annually in about 150 ports of the United States and its insular possessions.

#### 2. *Division of domestic (inter-state) quarantine*

Its activities fall under eight heads :—

- (a) The suppression of epidemics and the prevention of inter-state spread of epidemic diseases.
- (b) Aid in the development of State departments of health, especially divisions of communicable disease and sanitary engineering.
- (c) Control over water supplies used for drinking and culinary purposes on railroads, vessels and other carriers of inter-state commerce.
- (d) Sanitation of the national parks in co-operation with the National Park Service.
- (e) Measures for the control and prevention of trachoma.
- (f) Studies of and demonstrations in rural sanitation.
- (g) The annual conference of State and territorial health authorities with the Public Health Service.
- (h) Other contacts with State and territorial officials relating to health administration.

#### 3. *Division of foreign and insular quarantine and immigration*

This department is concerned with the prevention of entry of infection from foreign countries into the United States. It is also concerned with the medical examination of aliens

seeking admission into the United States for the detection of mental or physical defects or diseases which render them inadmissible under the immigration laws.

The introduction of infection into the country is prevented by three main lines of defence. The first is provided by the medical officers of the Public Health Service who are stationed in all important ports throughout the world. They issue bills of health to all vessels bound for the United States of America and they also assist the American consular officers in providing information relating to the sanitary conditions prevailing at these ports and countries. The second consists of the quarantine inspection of vessels arriving from foreign ports and no vessel is permitted entry until granted a clearance--'pratique'—by the quarantine officer. Quarantinable diseases specifically included within the scope of the quarantine laws of the United States, the Pan-American Code of 1924 and the International Sanitary Convention of Paris of 1926 are cholera, yellow fever, typhus fever and small-pox. The third consists of follow-up work, especially of cases of contagious or infectious diseases which are not quarantinable, by the Public Health Service co-operating with the United States Immigration Service and the respective State and local health authorities throughout the country.

#### 4. *Division of personnel and accounts*

This department is concerned with the recruitment of commissioned personnel. It keeps records of appointments, promotions, leaves or absence and other matters and is also concerned with maintenance of discipline. It is responsible for keeping financial records of the manifold activities of the Public Health Service.

#### 5. *Division of sanitary reports and statistics*

This has two important functions, (1) the collection from all parts of the world, including the United States, of information relating to public health and (2) the dissemination of this information to all persons and organizations interested in public health administration. Nearly 10,000 public health officials and paid subscribers receive the weekly reports of the Public Health Service.

#### 6. *Division of scientific research*

The scope of the activities of this division is extensive. Its researches include the study of (a) basic sciences in the laboratory, (b) clinical material, (c) epidemiology, (d) sociology and economics, (e) vital statistics and (f) public health administration. In addition, the department is entrusted with the control of biological products which includes, among other things, inspection in many parts of the United States and of other countries.

\* Health Departments of States and Provinces of the United States and Canada—Public Health Bulletin No. 184—for sale by the Superintendent of Documents, Washington, D.C.

### 7. Division of venereal disease

The work of this division includes (a) research into the treatment and methods of control of venereal diseases, (b) co-operation with State and local health authorities in the development and maintenance of control measures and (c) educational propaganda.

### 8. Division of mental hygiene

This department concerns itself with the problems of drug addiction, with the supervision and supply of medical and psychiatric service in Federal penal and correctional institutions and with studies of the causes, prevalence and means of prevention and treatment of mental and nervous disorders.

This brief outline gives an indication of the very extensive field of public-health endeavour covered by the activities of the Federal Health Service of the United States. When the Federation of United India begins to function in the near future it will be confronted with the task of organizing adequate public-health machinery to deal with problems similar to those of the United States of America, if this country is to keep in line with progressive countries of the world and if it is to make a serious attempt to reduce the appalling waste of human life and energy which the present high rates of sickness and mortality represent.

As regards legislation, most public-health problems have an inter-state aspect apart from the interests of the individual states constituting the federation. All health matters of an inter-state nature, as also those relating to India's international obligations, can be included in a comprehensive legislative measure. The United States of America, Canada, the Union of South Africa and Australia all provide examples of federal health legislation and India can, with advantage, avail herself of their experience in shaping her own laws.

The reform of local bodies is equally important. Without this reform, the strengthening of the federal machinery will not produce adequate results. Past experience has shown clearly that the control of local governments over local bodies must be strengthened and those who might view with concern any such proposal should recall the example of England. The Statutory Commission has made a reference to this question in the following words:—

'Indeed, the history of local government in Great Britain during the nineteenth century might be described from one angle as the steady invasion by the Central Government of a sphere formerly left entirely to local authorities. No picture of British local self-government could be more false than that which depicts the local authorities as enjoying the largest possible independence of outside control.....To those accustomed to the very real influence exercised over local bodies in England, not only by way of punishment and correction, but by advice and

encouragement, this mistaken idea of freedom from provincial control appears to have had the most unfortunate results in India'.

The proposed central legislation should include provision for securing a desirable level of efficiency in the administration of local bodies throughout the country and, to this end, it will be necessary to provide both for the exercise of punitive powers and for a careful distribution of grants-in-aid, the grants being made conditional on the acceptance of governmental supervision and inspection. These are, in fact, the methods by which the central authority in England maintains control over local bodies. Within the framework of such a statutory enactment on an all-India basis the provincial legislatures can be left free to modify control over their local bodies in such directions as are necessary to meet local requirements.

Another point of importance for efficient local government is the elimination of the interference of elected members in day-to-day administration. In the words of Harold J. Laski (1930) 'No small part of local government is definitely expert administration in which general opinion is only valid upon large issues of policy on the one hand and finance on the other'. It follows that routine administration should, as far as possible, be vested in experts who are not subject to continual pressure from the electorate. It may be argued that the transference of administration into the hands of experts would mean a negation of self-government and that it would lead, eventually, to the loss of the educative value which local government should have on the citizen, by making the administration progressively more and more aloof from public opinion. The claims of experts and of public opinion in shaping policy can be reconciled by making suitable changes in the machinery for administration. Let us first deal with public opinion. Even now much of the work is being done by *ad hoc* committees of the local authority. Statutory provision may be made for the compulsory co-option of outside members on these committees. For instance, a Public Health Committee, on which there is a fair representation of outside medical, nursing and other allied professions, should be able to stress the point of view of the public in regard to health policy and the medical officer of health should find the presence of these co-opted members helpful to him in securing support for his proposals. As the co-opted members of the committee would not be on the council of the local authority, they might not be able to influence the final decision by that body, but proposals which have the support of public opinion will not ordinarily be lightly rejected. At the same time, the responsibility for acceptance or rejection of a measure, on financial or other grounds, must ultimately rest with the council of the local authority, because it consists of elected representatives of the people; in that lies the essence of

self-government. To quote Laski (1930) once more, a democracy must, 'if it is to work, be an aristocracy by delegation. But the fact of delegation is vital. Men grow to their full stature only in the environment of responsibility. Their character, as Goethe said, is formed upon the billows of the world'. Democracy can therefore be a living force only by leaving the final decision in the hands of its elected representatives. It is desirable, however, to secure the association of a wider circle of public opinion with the decisions of the local body than is now being attempted through the presence of a few elected members. Further, in regard to particular aspects of administration, such sections of the community as have special knowledge should be encouraged to take part in determining policy. Only in this way can local government become truly educative and public opinion effectively influence the administration of the local authority.

As regards the expert, if his opinion is to be of any value, he should be able to tender his advice fearlessly and he must, therefore, be given security of tenure. Under existing conditions, this can best be done perhaps by constituting provincial cadres, under the local self-government department of the provincial governments, for all important posts under local bodies. This proposal makes for uniformity in regard to the methods of recruitment and conditions of services and should also ensure some measure of uniformity with respect to performance. Such services on a provincial system of recruitment are already in existence in several provinces as regards medical officers of health whilst in Madras Presidency, executive officers and engineers have also been provincialized. The appointment of paid executive officers for routine administration is the only method of avoiding the lowered efficiency pointed out by the Statutory Commission as being due to the interference of the elected members in the details of administration. The minister at the head of a local self-government department is himself subject to popular control through the provincial legislature and there is little likelihood of his permitting administration by experts to become a negation of local government.

Mention has already been made of the necessity to co-ordinate the medical and public health departments under a single administrative head. The present system of working in two compartments is an inheritance from the past and is anomalous. The best method of achieving unification would be to have in each province a chief medical officer responsible to the minister of health for the administration of both departments, with two deputies in charge of the medical and public-health sections respectively. It is desirable that the chief medical officer should combine in himself both medical and public-health experience. It is therefore

suggested that the person appointed should have a recognized public-health qualification. Such a rule is already in operation with regard to the selection of the chief medical officers on Indian railways.

In this way both unification of control and co-ordination of activities would be attained.

As regards the central government's organization, the present position is that the Director-General of the Indian Medical Service is the administrative head, whilst the Public Health Commissioner is his subordinate, although he is also advisor to the Government of India on all public-health matters. Subject to control by the Director-General, the Public Health Commissioner has also administrative control of the Indian Research Fund Association, which allocates annually considerable grants for medical research in India. He is responsible for the collection and dissemination of medical intelligence and, in regard to India's international health relations, performs important functions as permanent delegate of the Government of India to the Office International d'Hygiene Publique in Paris, as a member of the Health Committee of the League of Nations at Geneva and as a member of the Council of the League of Nations Bureau at Singapore. In the domestic sphere he has no powers of supervision over the activities of the provincial public-health departments but his advice is available when required. He co-ordinates and regulates the collection of vital statistics through provincial agencies and issues a consolidated annual report which reviews health conditions throughout the country.

The development of an adequate Federal Public Health Service in India will necessitate reorganization of the technical staff at the centre under the Federal Minister of Health. The Public Health Commissioner performs the health functions. At the same time the development of medical services in India and the peculiar position that the Indian Medical Service occupies, in that its recruitment is based on the military and civil needs of the country, render it essential that the Director-General should remain. But any additions to the public health technical staff at the centre should be placed under the control of the Public Health Commissioner. Administrative direction over all central health activity would therefore remain in his hands and although he would also maintain direct contact with the Government, his position of subordination to the Director-General would promote the necessary unification of all medical services under the Central Government. At some future date, when expansion of the central health services has occurred, the merging of the two offices and the creation of separate sections for each department of health endeavour might become necessary, especially if public-health activities should show such widespread ramifications as

those of the Federal Health Service of the United States of America.

Another question that requires consideration is the problem of assimilating the indigenous systems of medicine into the national health programme. The two main systems are (1) the Ayurvedic and (2) the Unani which represent the Hindu and Mohammedan systems respectively. Both have a wide appeal to the people of India and local governments and local bodies have, under pressure of public opinion, accorded them considerable support. For instance, in Madras an ayurvedic college is maintained by the provincial government whilst many local authorities throughout the country subsidize dispensaries practising one or other of these systems of medicine. Nor can it be denied that the pharmacopœias of these systems contain a number of useful drugs. At the same time it must be remembered that, subject to variations due to climatic, racial, dietetic and other factors, the human system remains the same throughout the world and that the methods of patient research into the causation, treatment and control of diseases pursued by Western medicine must remain the sheet anchor for man in his fight against ill health. In regard to such important branches of medical science as physiology and pathology, the Indian systems represent a stage of arrested development, whilst Western medicine is dynamic with all the life of a growing organism. Would it not therefore be to the national interest to conserve the meagre resources, that are available, for developing the health services rather than divide these on the maintenance of different systems of medicine? By all means make use of anything in these systems which organized research may show to be of value but even legitimate pride in the nation's past should not be permitted to keep India from the broad road of orderly progress along which other nations of the world are marching towards a slow but increasing mastery over man's bodily ills.

The expansion of public-health activity in India within the last fifteen or sixteen years has only resulted in providing a skeleton public-health staff, which is quite inadequate for dealing with the large populations and extensive areas entrusted to them. As an example we may take the province of Bengal. Each district has a district health officer and under him there is a sanitary inspector for each thana. Even such provision is much in advance of some other provinces. As regards Bengal an idea may be formed of the present position from the following quotation from Dr. G. L. Batra's 'Hooghly Health Book'. He states that, with respect to this district, 'a sanitary inspector, assisted by his health assistant and a vaccinator, serves, on an average, a population of 60,000 living in about 170 villages spread over an area of 80 square miles. The inadequacy of the staff, especially in view of the fact that they

have to carry out all public-health duties—control of infectious disease, food adulteration, propaganda, school hygiene, anti-malarial work and others—is, therefore, so evident as to require no further comment. Lack of adequate facilities for communication in some parts of the district, like Arambagh thana, renders the position worse, particularly in the rainy season. It must, however, be admitted that Hooghly and Howrah are the best districts in Bengal for communications and are also the smallest in area, population and number of villages. In Midnapore, for instance, in some of the health circles the same staff has to be responsible for a population of over 120,000 living in about 800 villages in an area of over 400 square miles'.

Side by side with the above description of conditions in Bengal I may present, in the words of Sir George Newman (1932), a picture of the development of health activity in England and Wales, which gives some idea of the strength and variety of public-health services that have been provided in that country. He says 'Under the Poor Law Amendment Act of 1834 Parliament created part-time medical posts in the poor law medical service, to be filled by medical men willing and desirous to render such service in addition to their private practice. In due course 2,000 to 3,000 medical men thus became district medical officers for the poor. Parallel with this movement, and under the same Poor Law authorities, there were appointed a similar number of medical men as public vaccinators. From 1848 onwards medical men became part-time medical officers of health, and by 1875 the whole country was divided into sanitary areas with such medical officers engaged in a rapidly expanding public-health service. Within a generation a third medical service arose under the Factory Acts and 2,000 medical practitioners became certifying factory surgeons. This was followed by a fourth public medical service, and by 1910 there were a thousand school doctors. Then came a fifth group under the Maternity and Child-Welfare Act of 1918, in which 3,000 to 4,000 doctors are engaged. Concurrently Parliament approved (1912-16) of the appointment of medical officers for public medical services for tuberculosis, venereal disease, and mental deficiency'. At the same time about 15,000 medical practitioners are engaged under the National Insurance Act and their work affects the health of about 15 million people or more than a third of the whole population.

England and Wales have a population of about 40 millions as enumerated at the 1931 census, while that of India is about nine times as many millions. These figures should help us to form some idea of the magnitude of the task before the statesmen and administrators of this country if they are to make provision for an expansion of public-health activity on modern lines. It is recognized that progress must necessarily be slow both from the point of view of



cost and of providing the necessary trained personnel. However it is essential to have a vision of the comprehensive plan, though its fulfilment may be a process of many long years.

Lastly, the question of finance should receive attention. The Indian Statutory Commission emphasized the necessity of more efficient control over the local bodies with respect to the management of their finances. Legislative and administrative action towards this end is essential. But, apart from this, the question of making more money available for public-health and other social services must equally receive attention. In a survey of India's financial position the Commission's Financial Assessor expressed himself in the following words:—'India is incurring expenditure on the primary functions of Government, such as defence and the maintenance of law and order, as high in proportion to her wealth as Western nations. Her expenditure on social services, such as education, sanitation, etc., on the other hand, is far behind Western standards, and indeed in many directions is almost non-existent'.

After discussing income and expenditure he came to the conclusion 'that the utmost administrative economies or any reduction that could be contemplated in the army budget would not yield a sufficient margin to finance without additional resources the large expenditure that would be needed, if India was to make satisfactory progress socially and economically'. I am hardly competent to discuss the ways and means of raising money. The Financial Assessor estimated that taxation, in relation to national income per head, was about 8 per cent in India as against 20 per cent in Great Britain and Japan. If these estimates are correct, do they not suggest that, in this country, there is room for fresh taxation in order that funds may be made available for the expansion of social services? The remarks of the Financial Assessor on this question of raising money by fresh taxation are pertinent and are therefore quoted below:—

'It is commonly assumed that this ratio (8 per cent) cannot be raised owing to the poverty of the people, and it is, of course, true that it is impossible to take in taxation as large a proportion of the income of people who are living on a bare subsistence level as is possible in cases where there is an appreciable margin over the minimum needs of life. But though the population of India consists in the main of extremely poor people, it is at the same time a country in which there are large accumulations of wealth on which the burden of government rests very lightly. In spite of the widespread poverty in India, I see no reason to doubt that the public revenues of India can be substantially increased without taxation becoming intolerable, provided that its incidence is adjusted to the capacity of tax-payers to pay and

that heavy additional burdens are not put upon primary necessities.

'On the other hand, there can be little doubt that, in conditions such as those which now obtain in India, it should be possible to stimulate production and to increase the welfare of the people by public expenditure designed to give greater economic security (by irrigation works, improved and more varied methods of cultivation, etc.), better physical well being (sanitation, water supply, improved public health, etc.), and education. Indeed, taxation may be the only practicable means of creating a better and more secure livelihood'.

Under a democratic form of government, the willingness of a community to tax itself for the public benefit indicates a high sense of civic responsibility. India's past history has been one of autocratic administration. She has only started on her path towards the realization of democratic control. As stated by the authors of the Montague-Chelmsford Report, the placidity of the Indian masses has been deliberately broken by the introduction of the Reforms and the conferment of the vote on an expanding electorate. One of the immediate results of such action has been to increase greatly the cost of administration. At the same time there has been, however, a quickening of the response of governments, through the ministers, to the needs of the nation-building departments such as education, health, agriculture and industries. It remains to be seen whether the increased burden of expenditure and some loss of efficiency, which has unavoidably crept in, will be compensated by a rising political consciousness of the people. This is the true test of the Reforms, because a widening political consciousness can alone lead to a progressive realization of the ideal of self-government, namely, government by the people for the people. With the political education of the masses is bound up a rising tide of popular demand for better living conditions, which will eventually direct that all the available national resources shall be devoted to the task of improving the health and happiness of the people. Sir George Newman (1929) has pointed out that, in England, 'Every extension of the franchise, in 1832, in 1867, in 1884 and in 1919, has been followed by a period of administrative reform by which democratic ideals should become political rights in the actual service of the State'. It is to be hoped that in India this experience will repeat itself and that the steady process of democratic evolution will prove to be a source of strength for the support of such vitally important services as education, health and agriculture.

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## Medical News

### INTERNATIONAL CONGRESS ON HEPATIC INSUFFICIENCY

THE International Congress on Hepatic Insufficiency, which will be held in Vichy from 16th to 18th September, 1937, under the distinguished patronage of the Minister of Public Health, has obtained the adhesion of fifty countries and is under the Presidency of Honour of Professors G. von Bergmann (Berlin), P. Carnot (Paris), Mariano R. Castex (Buenos Aires), A. Dustin (Brussels), Sir W. Langdon Brown (London), G. Maranon (Madrid), E. Marchoux (Paris), W. Orłowski (Warsaw), N. Pende (Rome), G. H. Whipple (New York), and under the presidency of Professor M. Loeper, Member of the Académie de Médecine.

French and foreign physicians are admitted as titular members of the congress.

The subscription of titular members is 50 French francs; this entitles them to the publications of the congress.

Titular members may be accompanied by two associate members (wife and unmarried children). The subscription of each associate member is 25 French francs; it is the same for hospital interns and medical students, both French and foreign.

Applications for membership of the congress will be limited to the accommodation available at the hotels where the members will stay; the closing date has been fixed at 31st July, 1937.

For the duration of the congress, members will be accommodated free of charge and free of all taxes.

They will only be required to pay for meals and beverages taken at the hotel, where they will be allowed 15 per cent off the normal prices—service 15 per cent extra.

The French main railway lines are allowing members, in the form of individual vouchers, a reduction of 40 per cent; this applies to wives, sons under age or unmarried daughters accompanying them. These vouchers will be valid: on the outward journey, from place of residence to Vichy, and on the return journey, from Vichy to residence—with option to pass through and stay in Paris both on the outward and on the homeward journey.

The right to these travel concessions will be valid from the 7th to the 24th September, 1937.

Foreign members will be entitled to benefit either by the above reduction offered them specially for the congress or the still more advantageous concession granted foreign visitors to the International Exhibition of 1937 which comprises, subject to the issue of visitors' identity card (five days' minimum stay in Paris, day of arrival and departure included), a reduction of 50 per cent and three months' validity, with possibility of making a roundabout journey and right to break the journey.

On the occasion of the exhibition and on production of visitors' identity card, travellers from overseas may obtain special terms from the French air lines.

Travel agencies and steamship companies will furnish members with full information and at the same time advise them of the reductions granted, either for the exhibition or for the congress, on foreign railway systems.

Under the patronage of a committee of ladies, entertainments will be provided for associate members during the congress.

All applications for information, adhesions or subscriptions must be addressed to Dr. J. Aimard, Secretary-General of the International Congress on Hepatic Insufficiency, 24, Boulevard des Capucines, Paris (IXe).

It may be recalled that this congress will be preceded by the Second International Congress on Gastroenterology, to take place in Paris on the 13th, 14th and 15th September, 1937, under the presidency of Prof. Pierre Duval.

### ALL-INDIA OPHTHALMOLOGICAL SOCIETY'S FIFTH CONFERENCE

THE fifth conference of the society was held on the 18th, 19th and 21st December, 1936, in the Patiala Block of the King Edward Medical College, Lahore. A large number of visitors and members were present at the opening of the conference.

Members and visitors assembled in the hall at 10-15 a.m. on the 18th for the formal opening of the conference. In the unavoidable absence of the president, Lieut.-Col. R. E. Wright, I.M.S., Col. A. M. Dick, I.M.S., the local secretary, introduced Rai Bahadur Mathra Das Pahwa, chairman of the reception committee, and called upon him to welcome the members. In his address he referred to the eye diseases prevalent in the Punjab and the work done by Col. Smith and others to mitigate the sufferings of the people of the province. He hoped that the delegates would have an enjoyable stay in the city.

Sir Sahcb-ud-din, Khan Bahadur, the Honourable Minister for Education, was then requested to open the conference. In declaring the conference open, he referred to the high prevalence of eye diseases in the Punjab and eulogised the services rendered by the physicians and surgeons to deal with the situation.

Col. A. M. Dick then formally proposed that in the unavoidable absence of the president-elect Lieut.-Col. E. O'G. Kirwan, I.M.S., Dr. B. K. Narayana Rao, Director, Minto Hospital, Bangalore, be elected to the presidentship of the conference. Dr. Srinivasan seconded the proposal which was carried unanimously.

In the course of his address Dr. Narayana Rao referred to his difficulties in being called upon to preside at the eleventh hour over the deliberations of the conference. He spoke of the present position of ophthalmic work in this country specially in Southern India. He referred to the work done in the Mysore State for eye diseases specially on the preventive side.

As there was sufficient time left at the opening session a few papers were read.

The opening paper on the symposium on diabetes and eye-affections by Dr. S. K. Mukerjee was read by Dr. B. N. Bhaduri in the absence of the author. Then Dr. Banaji read an interesting paper on the operation of iridencleisis. The opening session closed with another paper on drug idiosyncrasies in ophthalmic practice by Dr. B. K. Narayana Rao and Dr. M. Ponnambalam, which was read by Dr. Krishnamoorthy. A few members including the president took part in the discussion on the last paper.

In the evening session at 2 p.m. the following papers were read:—

1. Results of cataract extraction in diabetes, by Dr. C. N. Shroff.
2. Ocular complications in diabetes with special reference to Bengal, by Dr. Md. Refatullah.
3. Diabetes and retinal hæmorrhage, by Dr. S. M. Kaul.
4. Refractive changes in diabetes, by Dr. S. K. Bagehi.
5. Ocular injuries and the incidence of sympathetic ophthalmia in South India, by Drs. B. K. Narayana Rao and M. S. Mehkri.

Many members took part in the discussion on these papers and many interesting observations were made.

At 4 p.m. a group photograph of the members was taken, after which Col. A. M. Dick and Mrs. Dick were 'at home' to members of the society at Nedous Hotel. After tea some of the delegates were shown round the Shalimar gardens in the city.

On the 19th morning at 10 a.m. Rai Bahadur Mathura Das demonstrated the intracapsular operation for cataract in the Mayo Hospital eye theatre. The scientific session commenced punctually at 11 a.m. and the following papers were read:—

1. Modifications in Smith's intracapsular cataract extraction to make it easier and safer for the conditions in India, by Dr. C. N. Shroff.
2. Technique of cataract operations followed in the eye infirmary, Calcutta Medical College Hospitals, by Dr. H. K. Indra.
3. Treatment of senile cataract by Smith's technique, by Dr. Sohan Singh.
4. Observations about 'Capsulocleisis in glaucoma', 'Iridectomy ab externum' and 'Secondary stitch in extraction', by Dr. P. D. Giridhar.
5. Incision with conjunctival bridge in cataract extraction, by Dr. P. D. Giridhar.
6. Observations on the curative value of different operations in chronic glaucoma, by Dr. Harbhajan Singh.

In the afternoon at 2 p.m. the following further papers were read:—

1. Some observations on a case of 'primary glaucoma' with report of a case of marked recovery of vision, by Dr. M. S. Mehkri and Dr. K. Krishna Murthy.
2. Transplantation of cornea. Report of two cases, by Dr. B. K. Narayana Rao and Dr. M. P. Krishna Rao.
3. Corneal grafting, by Lieut.-Col. E. O'G. Kirwan, I.M.S.
4. A few cases of corneal grafting, by Dr. S. K. Mukerjee.
5. Contact glasses and their uses with an account of ten cases, by Dr. P. K. Biswas.
6. Colour vision testing, by Dr. J. Cairns.
7. A case of syphilitic tarsitis, by Dr. S. N. Mitter.
8. Static and dynamic retinoscopy, by Dr. Jaggan Nath Piplani.
9. Intracapsular made easier than capsulotomy, by Dr. K. C. Dutt.

At about 4-15 p.m. Rai Bahadur Mathura Das and Mrs. Mathura Das were 'at home' to the members in their house.

A meeting of the committee was held at 6 p.m. in Col. A. M. Dick's place.

At 8-30 p.m. the Annual Dinner of the Society was held in Nedous Hotel. A large number of members attended the function. Toasts of the King-Emperor and of the society were proposed and responded to.

On the 20th at 12 noon members were taken by car to Amritsar and were shown round the town. They visited the Golden Temple and were entertained by Dr. Sohan Singh in his house at 4 p.m. The party came back to Lahore by 8 p.m.

On the 21st morning members assembled in the Patiala Block at 10 a.m. The following papers were then read and discussed:—

1. Congenital retinal fold, a case report, by Dr. M. S. Mehkri and Dr. K. Krishna Murthy.
2. Acute keratoconus, by Dr. M. S. Mehkri.

3. Persistent hyaloid artery, report of three cases, by Dr. S. Vasudeva Rao.

4. Three cases of thrombosis of central retinal vein, by Dr. S. Vasudeva Rao.

5. Congenital retinal fold, by the Staff of the Government Ophthalmic Hospital, Madras.

6. Ectopia lentis.

7. Late effects of radium in a case of angioma of the lid.

8. Tuberculoma of lid, by Dr. S. N. Kaul.

9. Retinal hæmorrhage cured, by Dr. S. N. Kaul.

10. Proptosis after retro-ocular hæmorrhage, by Dr. S. N. Kaul.

11. Influence of dark adaptation on the variation of intraocular tension in epidemic dropsy patients, by Dr. B. N. Bhaduri and Dr. C. K. Biswas.

12. Operative treatment of glaucoma in Bengal, by Capt. S. C. Dutt.

In the last session at 2 p.m. the following papers were read:—

1. Orbital tumours, by Rai Bahadur Dr. S. H. Pandit, with demonstration of two cases.

2. Therapeutic value of iodine in infections of the eye, by Dr. Pratap Singh Sindhu.

3. Incidents of different refractive errors in our hospital practice, by Dr. M. P. Krishna Rao and Dr. M. B. Sundara Rao.

In the absence of the authors and for want of time a large number of papers received were taken as read. Before the conclusion of the session two films were shown to the members:—

(1) Film on 'Lamps of Life' sent by Lieut.-Col. E. O'G. Kirwan, Honorary Secretary, Blind Relief Association, Bengal (demonstrated by Dr. P. K. Biswas).

(2) Intracapsular cataract operation, by Rai Bahadur Mathura Das.

At 3-45 p.m. the general meeting of the members was held under the presidentship of Dr. B. K. Narayana Rao.

At 4-30 p.m. the Students' Union of the Medical College, Lahore, was 'at home' to the members in the college grounds.

Thanks of the society are due to the members of the reception committee for all the arrangements made to ensure the success of the conference. The grateful thanks of the society are also especially due to Lieut.-Col. Barucha, I.M.S., Principal, Medical College, for so kindly lending the use of the lecture hall in Patiala Block, King Edward Medical College, Lahore, for its meetings.

#### DR. H. DE SA SILVER JUBILEE PRIZE

THE Bombay Obstetric and Gynaecological Society has selected the following subject for the thesis for the above prize for 1937-38:—

*'Morbidity and mortality of mother and child in breech labour with local statistics'*

The prize is open to all medical persons registered by the Bombay Medical Council and of not more than five years' standing. Time to submit the thesis will be some time in March 1938.

For further particulars write to the honorary secretaries of the Society, Raj Bhuvan, Sandhurst Road, Bombay 4.

#### AN UNQUALIFIED MEDICAL PRACTITIONER FINED

JUDGMENT has been delivered by the Additional District Magistrate of Jullundur in a case under section 6 of the Indian Medical Degrees Act, 1916, and under section 23 of the Punjab Medical Registration Act II of 1916, in which one Hazara Ram Dard of Nawanshar, District Jullundur, an unqualified medical practitioner, who exhibited the qualifications of 'M.B., Ch.B.' after his name and described himself as a 'registered' medical practitioner, was found guilty and was fined Rs. 50 or in default two months' imprisonment. The complaint

was lodged by the Punjab Medical Council, with the sanction of the local Government.

LAHORE,  
16th April, 1937.

### INTERNATIONAL LEPROSY ASSOCIATION

ARRANGEMENTS are being made to hold the 4th International Leprosy Conference in Cairo, beginning on the 21st March, 1938. This conference is being organized by the International Leprosy Association, and this will be the first International Conference to be arranged by this association since its inauguration in 1931. Three previous conferences of this nature have been held—at Berlin in 1897, at Bergen in 1909 and at Strasbourg in 1923.

The Egyptian Government is inviting all countries concerned to send official delegates. In addition to these, doctors and others interested in the subject are invited to be present. Full information can be obtained from the Secretary of the International Leprosy Association, 131, Baker Street, London, W.1.

### THE TINNEVELLY DISTRICT MEDICAL ASSOCIATION, PALAMCOTTAH

#### Headquarters meeting

THE Tinnevely District Medical Association held its monthly meeting at Palamcottah on Saturday, 29th May, 1937, in the premises of St. John's College. Members numbering 62, including three women doctors, were present.

The meeting began under the presidentship of Lieut.-Colonel T. S. Shastri, I.M.S., the president of the association. The secretary, after reading the minutes of the last monthly meeting, read the Code of Medical Ethics for the information of the members of the association.

Dr. M. Shenbagam Pillai of Sivagiri read out the notes of a case of calculus in a female urethra.

Dr. P. S. Srinivasan, L.M.P., of the Government Headquarters Hospital, Palamcottah, read the clinical notes on the following cases; the patients also were shown:—

Hydro-pyo-nephrosis, parotid tumour (right cheek), osteomyelitis (prontosil treatment), cancer of the stomach, and a large goitre.

The above cases were fully discussed by the members. Thereafter, the president brought the meeting to a close by his remarks on each case and summed up the salient and important features of all the cases. He thanked the college authorities for placing the college hall at the disposal of the Tinnevely District Medical Association for holding the meeting.

### INTERNATIONAL UNION AGAINST TUBERCULOSIS

At a meeting held in Paris with Professor Fernand Bezançon in the chair and attended by Professor Lopo de Carvalho, president of the Xth Conference of the International Union against Tuberculosis, and by Dr. Castello Branco, secretary-general of the conference, it was decided that the latter shall be held in Lisbon, from the 5th to the 9th September, 1937. The Portuguese organizing committee will forward to all the members of the congress the new programme of the conference.

The discussion will be limited to two main subjects: Biological subject: '*Radiological aspects of the pulmonary hilum and their interpretation*', opening report by Professor Lopo de Carvalho (Portugal); Clinical subject: '*Primary tuberculous infection in relation to family and domestic associates*', opening report by Drs. J. Hatfield (United States) and D. A. Powell (Great Britain). Ten speakers, selected in advance from a list presented by 44 countries belonging

to the union, have been designated to open the discussion on each of the questions on the agenda.

Members of the International Union are invited to take part in the conference free of any contribution fee. They may forward their application, if they have not already done so, either through the medium of their Government or their national organization against tuberculosis, or directly to the organizing committee in Lisbon, at the following address:—

Organizing Committee of the Xth Conference of the International Union against Tuberculosis Assistancia Nacional aos Tuberculosos Avenida 24 de Julho, Lisbon (Portugal).

Names may also be sent to the headquarters of the secretariat of the International Union against Tuberculosis, 66, Boulevard Saint-Michel, Paris (6eme).

Persons who are not members of the union and who wish to take part as 'members of the conference' must forward their application, together with a contribution of 200 escudos, exclusively through the medium of King George Thanksgiving (Anti-Tuberculosis) Fund, Indian Red Cross Society, 'Sherwood' Simla.

Members of the conference who have already sent in their contribution last year are exempted from any further payment.

### A NEW LECTURE THEATRE OPENED IN CALCUTTA

AN important step has been taken recently for co-operation between the scientific research workers of India and Germany.

The Pharmaceutical Department, Bayer, Leverkusen, Germany, represented by the Haverro Trading Company, Limited, in this country, has opened a lecture room at the latter's offices. We understand from the remarks made by Dr. A. G. Brocke, the local manager and scientific advisor to Bayer's during the opening function, held in the presence of a number of eminent scientists and medical men of this city on Friday the 28th May, that the lecture room is to serve the purpose of furthering friendly relations between the Bayer research laboratories and scientists in India.

Although the Pharmaceutical Department, Bayer, is a commercial concern, it has contributed a considerable share to medical and pharmaceutical researches in the last decades; many preparations which are nowadays household remedies and well known to the lay public, such as pyramidon and aspirin, were discovered in the Bayer laboratories. Further steps in the history of chemo-therapeutical research sponsored by Bayer are the discoveries of salvarsan by Ehrlich, Bayer 205 (for the treatment of African sleeping sickness), neostibosan for kala-azar as well as the latest development in malaria research marked by the introduction of atebriin and plasmochin.

Dr. Brocke referring to the previous work done emphasized that the Bayer works deserve the whole-hearted assistance of medical men and workers of related sciences in every country. Specially in investigating these preparations to be used in tropical diseases, Bayer laboratories are entirely dependent on the co-operation of investigators in India. Once the preliminary work in the chemical and pharmacological laboratories is finished and tests as to the tolerance of the preparation have given satisfactory results, they are as a rule administered to the few cases of tropical diseases obtained at home in the tropical institutes of Hamburg and Tübingen, as well as London. The bulk of the research work necessary to appraise these drugs at their true practical value and in the preparations has to be done in India and other tropical countries.

He concluded that the idea of strengthening these ties between workers in this country and the laboratories in Europe had prompted him to arrange these meetings which it is hoped would be a standing institution.

As a proof of this collaboration Dr. Brocke invited Dr. R. C. Bhattacharjee, Ph.D. (Leipzig), D.Sc. (Paris),

to deliver the opening lecture, the subject of which was his own researches on snake venoms conducted at his laboratories, Dum Dum.

In his lecture, Dr. Bhattacharjee emphasized the importance of sero-therapy in a country like India which is infested with various kinds of poisonous snakes and in this connection he mentioned the latest investigations carried out by the Behring Institute, Marburg, and the Pasteur Institute, Paris, and pointed out the difficulties that stood in the way of preparing a polyvalent serum by using venoms from different sources. He referred to the work already done in these institutions

with Indian snake venoms and to the various commercial sera available in the world market. He pointed out that only one efficient monovalent serum against one type of Indian snakes existed and that no truly polyvalent serum against Indian snakes has been prepared as yet. The field for these particular researches is vast and he believes that the co-operation between the workers of different countries will surely lead to success. Dr. Bhattacharjee has undertaken some tests with different commercial sera and is trying to estimate their therapeutic values on various Indian snake venoms.

## Current Topics

### Fluorine Poisoning

(From the *Lancet*, Vol. I, 17th April, 1937, p. 937)

MANY of our readers will recall the 'fog disaster' which occurred in the valley of the Meuse above Liège early in December 1930. Within a few days several thousand persons suffered from an acute pulmonary affection, and 60 lost their lives. A commission of inquiry was set up which came to the conclusion that the disaster was due to the accumulation of waste factory products in the air of the narrow steep river valley; a blanket of cold fog during windless weather acting like a closed roof to the valley. The commission suggested that sulphur dioxide (or its derivatives) was the chemical substance responsible. Those who were familiar with the physiological effects of  $\text{SO}_2$ , and especially those who have experienced considerable or prolonged exposure to this gas, were not impressed by the findings of the commission on this head. Dr. Kaj Roholm of Copenhagen now surveys the whole problem in the light of more recent knowledge about the toxicity of fluorine and its compounds and makes out a strong case for the belief that fluorine and not sulphur was the peccant agent. Here was a narrow deep valley, a dense pall of almost stationary fog, and in two places in the valley (at Engis and in the Sclassin-Seraign area) a number of factories (15 in all) throwing considerable quantities of fluorine into the air. It may be unlikely that such a combination of circumstances will arise in this country, but the possibility that chronic fluorine poisoning may be occurring cannot be so easily dismissed.

Fluorine poisoning may be produced as a result of industrial processes, from the ingestion of fluorine-contaminated soil or water, or occasionally (as in Iceland) it may arise from the dust of volcanic eruptions after it has settled on the soil. A number of industrial processes make use of raw materials containing fluorides: (1) Blast-furnaces, steel and metal works; Dr. Roholm estimates the world's yearly output of calcium fluoride (fluorspar  $\text{CaF}_2$ ) at 200,000 to 300,000 tons of which 80 per cent is used in blast furnaces. During the smelting of iron and steel, silicon tetrafluoride escapes into the air. (2) Glass and ceramic manufacture. (3) Zinc smelting: zinc ore usually contains fluorspar. (4) Superphosphate manufacture: phosphatite contains fluoride. (5) Chemical works. In the neighbourhood of some of the factories in the Meuse valley, it was observed that glass rapidly lost some of its transparency. Plant life was damaged around some of the factories. Animals fed upon contaminated herbage suffered from dental and bone diseases or died with emaciation and cachexia.

In acute fluorine poisoning resulting from breathing contaminated air, the symptoms and signs are those of an acute pulmonary oedema, similar to that seen after exposure to certain 'poison gases'. In chronic poisoning (whether the 'fluorine' is air- or water-borne) the characteristic symptoms are mottling of the enamel of the teeth; bony changes, (a) either a diffuse osteosclerosis with deposits in the ligamentous insertions of

the muscles, or (b) bony degeneration and softening (when the poisoning is more severe); general wasting; anæmia and cachexia. Now that attention has been drawn to this matter, no doubt a careful study of the possible risk in our industrial areas will be made. Dr. Roholm insists that factories giving off fluorine compounds should be required to take measures for effective removal of the fluorine compounds from chimney smoke.

### Practical Oxygen Therapy

By DOUGLAS FIRTH, M.D., F.R.C.P.

(Abstracted from the *Medical Press and Circular*, Vol. CXCI, 16th December, 1936, p. 533)

#### PRACTICAL THERAPY

OXYGEN therapy may be considered under four heads: (1) the conditions which call for oxygen; (2) the amount of oxygen needed; (3) the methods of providing this amount; (4) the practical difficulties.

(1) *The conditions which call for oxygen.*—As a general rule any case which is cyanosed will benefit by oxygen, but in the pneumonias—lobar, influenzal, or broncho—the earlier the oxygen is given the better the results, and the same statement applies to post-operative pneumonia. Acute bronchitis, or the acute exacerbation in the chronic case, responds well to oxygen, while chronic bronchitis and emphysema may be treated on somewhat different lines. Asthma *per se* does not benefit much, if at all, although in the Collinson apparatus, where certain drugs are vaporized by oxygen under pressure, oxygen probably plays a small part. In cardiac disease, where pulmonary complications exist, as pulmonary oedema or induration of lung, much benefit is usually experienced, as is the case with cardiac failure secondary to pulmonary disease. The form of paroxysmal dyspnoea known as cardiac asthma, really incipient pulmonary oedema, responds well to 50 per cent oxygen. Angina is not benefited by oxygen, but good results are said to have been obtained in coronary thrombosis, both as regards relief of pain and cyanosis. Finally, oxygen is the specific for respiratory poisons, such as  $\text{CO}$ , morphia and alcohol, combined perhaps with  $\text{CO}_2$ .

(2) *The amount of oxygen needed.*—Normal air contains 21 per cent of oxygen. To benefit the patient the inhaled air must contain 35 per cent to 60 per cent oxygen, giving 30 to 55 per cent in the alveolar air. Percentages less than 35 are useless, while 60 per cent in the alveolar air is irritating, and in a higher percentage it is definitely deleterious. It follows then that whatever method is employed it must be possible to estimate the oxygen percentage in the inspired air in a practical manner, and regulate the flow of oxygen so that the required percentage is obtained.

(3) *The methods of providing this amount.*—The various mask apparatus give a good percentage of oxygen, but very few patients will tolerate a mask

firmly tied over the mouth, and there are other drawbacks to prolonged administration through a mask, as the difficulty of keeping it in place, and condensation under the mask. But two practical methods are at hand, the double nasal catheter and the oxygen tent, and in both of these many valuable improvements have been made recently.

The best apparatus for intranasal oxygen is that described by Marriott and Robson, the double nasal catheter. The double tubes must be short,  $3\frac{1}{2}$  inches, and of soft rubber. Cycle valve tubing is soft, thin-walled, and cheap—4d. per yard, or thereabouts. They are fixed to a tube with a bifid end, which in turn is connected with the oxygen delivery apparatus. The metal tube is  $3/16$  inch, copper nickel-plated, and can be moved to secure the correct position. The security of the catheters in the nose is assured by the form of head-band employed. It is the type used by aurists for many years, the important part being the holder of the metal tubing which carries a couple of padded knobs, which can be bent to fit the nose. These are essential for the security of the headband, which passes below the occipital process behind, above the ears and below the forehead; the buckle to be kept at one side and the forehead piece padded with corrugated rubber.

The nose should be sprayed with adrenalin and cocaine (5 per cent) solution five minutes before insertion, and the catheter lubricated with liquid paraffin. If this is done, the preliminary insertion is well tolerated, and a high rate of flow over considerable periods can be maintained. Twelve days have been the maximum period for which I have kept a high rate of flow. It is important when using high oxygen concentrations that the average rate of flow should be maintained; this cannot be done by the rough method of bubbling through water—at the best an emergency method. The best method of gauging the flow is by the British Oxygen Company's Flowmeter (which at the same time moistens the oxygen). It is extremely simple to use, the rate of flow of oxygen being read directly off the calibrated rule of the position of the float. A dangerous burst cannot take place, in the event of an inexperienced person connecting up the flowmeter with a too full pressure of gas, as springs are embodied with each bolt so that the top flange can lift an excess of pressure. This flowmeter will show the flow of oxygen and the absence of flow whether there is resistance in front from a kinked tube or a lack of oxygen from an empty cylinder. The connections should be made of stout non-kinkable tubing and a pressure regulator; the ordinary reducing valve of the B. O. C. cylinder is necessary.

Marriott and Robson illustrate a type of cylinder holder which also has the advantage of the porter's barrow and can be wheeled by a nurse. This appears to be too small at the base, and we use a type of stand for the 200 ft. cylinder which cannot be upset. In using both the nasal catheter and the tent, the bigger the cylinder of oxygen the less the cost. Two stands are necessary: one in use and one kept filled by the united efforts of the hospital staff.

*The rate of flow—oxygen—per minute:*

4 litres	= 35 inhaled	30 per cent	alveolar.
8 "	= 45 "	40 "	" "
10 "	= 50 "	45 "	" "
12 "	= 55 "	50 "	" "

As 1 cubic foot = 28.3 litres, at 10 litres per minute, a 100-ft. cylinder will last  $4\frac{1}{2}$  hours, or five 100-ft. cylinders in 24 hours. At 45s. per thousand feet, the cost is something over a pound. While oxygen cost is high with double nasal catheter, there is no ice or protosorb as extras, and a special nurse is usually unnecessary.

As a rule eight litres per minute is as much as is tolerated for any length of time. The tubing must be thick (external diameter 6 mm.) and supported.

The new pattern (Poulton) tent is a most efficient method of giving oxygen. The oxygen is run directly into the tent which is cooled and dried by means of

an ice box inside the tent. The fabric of the tent is mackintosh and the airtightness of the tent is secured by making up the bed on a big (9 ft. by 6 ft.) mackintosh sheet and tucking in the tent.

The importance of air-tightness must be stressed to the nurse who makes up the bed. If the bed distends after the injection of oxygen for a minute or two, the junction is satisfactory. If the bed leaks, the oxygen percentage cannot be maintained. The oxygen is delivered from cylinder to tent by a pressure-reducing valve and injector. This is an extremely clever piece of work which maintains the circulation of the air in the tent. By means of a principle similar to the water pump, gases from the tent are extracted by one tube and returned by another, with a known quantity of oxygen per minute. In this circuit is a tin containing some substance to absorb  $\text{CO}_2$ , in this case protosorb.

Three other features are embodied in the injector: a flow meter to show the rate of delivery of oxygen, a gauge to register the pressure of oxygen in the cylinder, and a by-pass whereby the tent can be quickly flooded with oxygen. The cooling tin is filled with crushed ice to start, and later, as it fills with water, lumps of ice are added. In hot weather ice and salt are used. The outflow tube from tin and condenser must be kept under water, otherwise air will get in or oxygen leak out from the condenser tube. Wet and dry bulb thermometers are used to regulate temperature. I leave out technical details, which can be obtained from Campbell and Poulton's book, *Oxygen and Carbon Dioxide*, 1934, page 140.

The humidity is not always easy, as when the humidity is normal temperature is apt to be too low. It is also a little difficult to keep up the temperature when an infant occupies this tent. If below  $65^\circ$  to  $60^\circ$ , more clothes and hot water bottles will meet the needs of the case. With average use, about 36 lb. of ice will be needed in twenty-four hours.

After the preliminary 'flooding' of the tent with pure oxygen by the by-pass, the injector should be set to deliver three litres per minute. An analysis of the oxygen in the tent should be made after twenty minutes or so, and then at hourly intervals, to establish the rate of flow. At three litres per minute, a 100-cylinder should last sixteen hours (in practice it lasts ten, owing to loss from nursing manipulations which entail opening the tent). So the cost of oxygen is about half that of the double nasal catheter. The oxygen content of the tent should be examined hourly, especially if the patient needs much moving. Samples for examination are removed through a small tube at the front of the tent which is kept shut with a slip. The examination is not difficult to carry out, and a nurse can easily be taught. Reavell, in the August number of *The Lancet*, criticised the pipette, and with reason, but I believe a better oxygen pipette is to be placed on the market.

The  $\text{CO}_2$  is absorbed by protosorb, which is green when fresh and brown when exhausted. The container should last twelve to fourteen hours. The estimation of the  $\text{CO}_2$  is much more difficult, but it is hardly necessary with children and once in twenty-four hours suffices in adults. Note the colour of the protosorb, and, as Reavell suggests, listen for the hiss when the lid of the protosorb container is removed. If these two are satisfactory, frequent  $\text{CO}_2$  estimations, except when it is used therapeutically, seem to be unnecessary. Poulton does not entirely agree.

There is another use to which the tent may be put. For some time past the value of treating an emphysematous patient in a compressed-air chamber has been recognized. In this the patient remains for an hour at  $\frac{2}{3}$  of an atmosphere, half an hour being taken to raise the pressure to this point and a similar period to reduce it to the normal. Cough and expectoration are reduced, respirations become slower and deeper, and the pulse slows, with an increase in the vital capacity, and not only does the patient feel that he can breathe more easily, but he can also take exercise with less distress. These results are not due to



medicinal factors, but to the equivalent of 35 per cent of oxygen, which is the result of the increased pressure.

Compressed-air chambers are few and far between, but a substitute is to be found in the oxygen tent. The oxygen percentage can rapidly be raised to the required figure, and the cost is not great, as the oxygen consumption is only some three litres per minute. The vital capacity should be estimated both before and during treatment, of which the course should consist of an hour in the tent daily in 40 per cent oxygen for a period of at least thirty days.

Nursing is done through the 'sleeves' of the tent and, when necessary by untucking the bed. With regard to the tent in general, experience overcomes many of the nursing difficulties. Feeding and temperature taking can be done through the sleeves, although a double lift is difficult to manipulate. A hospital sister has said that it is impossible for two nurses to lift the patient without untucking the mackintosh, but the same stricture applies to the use of bedpans, washing and examining the patient, and the two latter must be kept within as small a limit as possible; Fowler's position cannot be maintained. Each time after the mackintosh has been untucked the tent should receive a supply of neat oxygen by the by-pass.

It is difficult to get at a patient hurriedly, as in hæmorrhage or vomiting, and it is most difficult to control a delirious patient. This again is of real importance, as a semi-comatose patient revives with oxygen and may show all stages between fractiousness and violence. This is a real difficulty, and we have had one violent patient die on the floor, mixed up with portions of the tent. The use of the tent undoubtedly demands a special nurse, and she may be able by persuasion to quiet the restless patient. Poulton goes much further, and suggests in cases of excitability 'some retentive apparatus'. He points out that delirium after coma in an oxygen tent is a good sign, and treatment should be continued. In these cases morphia should not be given as it may prove fatal.

Many patients dislike being put in the tent, a mild claustrophobia, or the self suggestion that oxygen being used as a last resort, often upsets them. But there is no physical discomfort in the tent, and the physician and nurse should be able to persuade the average patient to enter the tent. The relief afforded to the majority of cases speedily restores the confidence of the

patient. Children do very well and do not seem to mind in the least, while it is a striking lesson to see the pneumonic child go blue while being fed in the open and become pink again when restored to the tent.

In actual practice the injector seldom goes wrong, although it should be overhauled periodically by the makers; if it does, it is usually the exhauster, and in this event soda-lime, spread on a tray under the tent, would be a clumsy but effective emergency remedy.

After a patient has been in the tent with high-oxygen value, sudden removal must be avoided. If he has been in some time, a reduction of 10 per cent per diem is made. In a short time, the reduction may be quicker, or by double catheter. Changing cylinders is not harmful, as the patient gets on well in the tent while the injector is changed, or oxygen may be run in directly. No lights, electric or otherwise, must be brought near the tent; and all porters and nurses warned against the application of grease to the reducing valve thread: If grease is used, a violent explosion may occur.

Every hospital should have some form of apparatus for the efficient administration of oxygen.

The double catheter with a proper headband and flowmeter, can be procured at a cost of £9 9s. It is no good for children, but adults tolerate it well, and it provides a steady flow. The alveolar oxygen is much lower than in the tent, however, for the same flow, four to five litres per minute by catheter, giving alveolar oxygen of 33 per cent, and in the tent 45 to 55 per cent.

The actual cost of the tent and injector is greater—some £60—and much greater nursing difficulties are presented. It is, however, the way of giving oxygen to small children. A much more constant oxygen percentage can be maintained and less oxygen is necessary. Hence it is cheaper in this respect, but the cost of protosorb and ice must be added.

Every hospital should have the double catheter and flowmeter, and the time will come when each hospital will have its own tent, though not necessarily of the present pattern. In *The Lancet* of 19th September a brief description is given of an inverted oxygen tent with an open top, now being tried at St. George's Hospital, but I can offer no criticism, as I have no practical knowledge of the method, but the principle is sound.

## Reviews

**RECENT ADVANCES IN ENDOCRINOLOGY.**—By A. T. Cameron, M.A., D.Sc. (Edin.), F.I.C., F.R.S.C. Third Edition. 1936. J. and A. Churchill, Limited, London. Pp. ix plus 458 with 65 figures including three plates. Price, 15s.

THERE is no branch of medical science that is so pregnant with possibilities and is moving so rapidly as endocrinology. We are not therefore surprised to find another edition of this important book appearing a little more than a year after the previous one. Much new and important work is included in this edition and many sections have been completely rewritten.

A short but lucid account of the advantages of protamine insulinate is given and reference is made to the more recent work on zinc and its effect in delaying and prolonging the action of insulin. The writer points out that the supply of protamine from the sperm of the rainbow trout may be limited at first, but, he rightly adds, now that the principle has been established it will probably be easy to find other substances that will act as well, if not better, and he mentions spermine from beef pancreas as having an action somewhat similar to that of the protamines.

The thyroid gland which was one of the first glands to come under intensive study seems either to be giving up its secrets slowly or to have more secrets to

give up than other endocrine organs. Recent work on the effect of thyroxine on the respiratory rate or oxidation level of individual cells and groups of cells is well summarized, and Mansfeld's work, which appears to prove that in the individual cells thyroxine facilitates changes in protein metabolism and that it is conveyed to the cells along nerve fibrils just as is tetanus toxin, is given the prominence that it deserves. But the author points out that this control of oxidation does not appear to constitute the whole action of the thyroid gland, as many of the results of experimental hyperthyroidism and the features of clinical hypo- and hyperfunction of the gland cannot be explained on these grounds alone.

The volume provides fascinating reading for any physician and we recommend it whole-heartedly.

L. E. N.

**THE PRINCIPLES OF BACTERIOLOGY AND IMMUNITY.**—By W. W. C. Topley, M.A., M.D., M.Sc., F.R.C.P., F.R.S., and G. S. Wilson, M.D., F.R.C.P., D.P.H. Second Edition. 1936. Edward Arnold and Company, London. Pp. xv plus 1645. Illustrated. Price, 50s.

We are sorry to commence a review of the second edition of a book that is in our opinion by far the



best book on bacteriology in the English language, and probably in any language, by a criticism, but we shall feel happier and able to do justice to the book when we have got our expression of disappointment off our chest; sixteen hundred and sixty pages should never be bound in one volume, except perhaps when the book is to be chained to a lectern. As there is probably not a superfluous word—we do not claim to have read every one—and as the print is not too large, nor the page too small, the only alternative was to divide the book into two volumes. This was done most successfully in the first edition and we hope that those who criticized this decision are now sorry for what they have done.

Seven years is a long time in the life of a young science and every chapter in the book has had to be rewritten. How the authors managed to keep each chapter up to date is beyond our comprehension, but this feat they appear to have achieved and in many there are references to works published in 1936.

The book, as one can well imagine from its size, is not written primarily for the undergraduate student but for the more advanced student of bacteriology and we consider that it is the ideal book on bacteriology for the physician. Far more stress is laid on the relationship of the parasite with the host than on the parasite itself and its appearance and behaviour in the laboratory.

We will take one example—*Pasteurella* and plague. There is a chapter of 18 pages devoted to *Pasteurella*; the sub-headings are—Definition, Isolation, Morphology and staining, Cultural characteristics, Resistance, Metabolism, Biochemical reactions, Antigenic structure, Pathogenicity, Experimental production of plague, Pasteurellosis and pseudo-tuberculosis in animals, Classification and identification, *Pasteurella pestis*, *Pasteurella aviseptica*, *Pasteurella pseudotuberculosis* (in which a summary of the specific characters of each is given), and References (77).

Later in the book, there is a chapter of 22 pages devoted to plague, pasteurellosis and pseudo-pasteurellosis: the sub-headings are Plague, Epidemiology, Plague in rats, Experimental transmission of plague to rats, Mode of spread of plague in Bombay, Plague in other rodents, Pneumonic plague, Diagnosis of natural rat plague, Diagnosis of plague in man (during life and after death), Prophylaxis, Vaccines, Serum treatment, Pasteurellosis or hæmorrhagic septicæmia in animals, other diseases associated with *pasteurella*, Pseudotuberculosis (with minor sub-heading) and References. This 'menu' provides the bacteriologist and sanitarian with all he wants to know on the subject and leaves the physician with only a few details of symptomatology to be looked up in his standard textbook.

The subject of bacteriophage is taken more seriously in this edition than in the last. The author's conclude a 17-page chapter on the Twort-d'Herelle phenomenon by saying 'We must then, if we are to accept the virus hypothesis to which all other evidence clearly points, also accept the view that symbiosis between phage and bacterium is an exceedingly common event; so common that it would at the moment be unwise to assert that any bacterial strain was certainly not carrying phage'..... 'What place this symbiotic process will eventually take in our conceptions of bacterial structure, bacterial variation, antigenic behaviour, and other similar problems we cannot yet prophesy. It may be a relatively minor one; but it may not'. But in another place they say 'There is as yet no experimental evidence that the bacteriophages exert any protective or curative action *in vivo*; but this possibility needs further study'. In other words, they think it more probable that this phenomenon will necessitate the rewriting of books on bacteriology than those on clinical medicine, but they keep an open mind in both instances.

To criticize individual chapters would be difficult, to praise them presumptuous. We have little fear of contradiction when we say that this is most certainly the fattest book on bacteriology in any language, and

we still affirm that, despite this physical disability, it is also the best.

**RECENT ADVANCES IN GENITO-URINARY SURGERY.**—By H. Bailey, F.R.C.S. (Eng.), and N. M. Matheson, M.B., F.R.C.S., M.R.C.P. 1936. J. and A. Churchill Limited, London. Pp. viii plus 213 with 89 illustrations. Price, 15s.

GENITO-URINARY surgery is as fully qualified to receive separate treatment in this important series of books as the two authors are to write on this subject.

The outstanding 'recent advance' that has revolutionized genito-urinary surgery is excretory urography and for this reason alone it is fitting that this should form the subject of the opening chapter. The next chapter is on renal function tests—other than by excretory urography, and then from diagnosis the authors turn to the treatment of uræmia; the chapter is a little 'sketchy'. With the chapter on congenital abnormalities one feels that the authors have really got down to their subject. Thence the whole field is covered chapter by chapter, but always briefly, sometimes, one feels, to the sacrifice of clarity.

Ketogenic diet is recommended for coli-form infection of the urinary tract, but details are not given and the reader is rightly referred to a recent book on medical treatment. Mandelic acid is also mentioned favourably together with sodium mandelate, but not ammonium mandelate. 'Mandelic acid is given four times daily in doses of 3 grammes per ounce neutralized by sodium bicarbonate.....' is not a very thoughtfully worded sentence. Nor is it made clear that it is best to give the ammonium chloride first for a day or two before commencing the mandelic acid. Later, in the chapter the cryptic remark, that 'several prominent American urologists are satisfied that pyridium is an antiseptic of quite exceptional value' carries with it an atmosphere of scepticism but leaves the reader in the air.

The surgical procedures are well described and the book is adequately illustrated. Altogether it is a worthy new member of this excellent series.

**THE MODERN DIETARY TREATMENT.**—By M. Abrahams, M.A. (Oxon.), M.Sc. (Columbia Univ.), and E. M. Widdowson, B.Sc., Ph.D. (Lond.). 1937. Baillière, Tindall and Cox, London. Pp. ix plus 328. Price, 8s. 6d.

THE title of this book does not seem to us to be a very happy one; the impression conveyed—to us at least—was that it was a treatise on the treatment of disease by diet, and by diet alone. A more suitable title would have been 'Dietary in Modern Treatment' or 'Modern Dietary in Treatment'. The book is in actual fact a very practical one written by a dietitian at one and a biochemist at another of London's leading hospitals. Neither author has a medical qualification and the language used is simple and more suitable for the nurse or the non-qualified dietitian than for the student or the doctor. The diets, recipes and tables which are the most valuable part of the book and which occupy more than half of it, will be found equally useful by all concerned with the care of the sick.

The 'diets' cover about a hundred pages: all the well-known diets, such as Lénhartz, the ketogenic, various diabetic, salt-free, restricted-protein, low and high caloric, etc., are given in detail.

Recipes for the preparation of soups, custards, cereals, vegetables, puddings, etc., cover about 40 pages and should help to make the life of the invalid more interesting.

The tables are numerous and varied: the largest table gives the chemical composition of foods: others deal with proprietary foods, cooked foods, vitamins, alcoholic beverages, etc. There are also height and weight tables for men and women.

The book is a valuable practical contribution to the subject of dietetics and we can strongly recommend it as a book of reference for hospitals: it will admittedly be more valuable in European hospitals.

L. E. N.

**THE FUNDAMENTALS OF ELECTROCARDIOGRAPHIC INTERPRETATION.**—By J. B. Carter, M.D. 1937. Baillière, Tindall and Cox, London. Pp. xv plus 326 with 250 illustrations. Price, 20s.

ELECTROCARDIOGRAPHY has established a definite place for itself in clinical practice. A cardiovascular examination is incomplete without an electrocardiogram. In this small volume, the author has attempted to present the fundamental principles of electrocardiography in a simple and concise manner, in order to aid a beginner in acquiring a working knowledge of the subject.

After a preliminary physiological consideration, the book briefly deals with the electrocardiographic technique followed by descriptions of the waves of the normal electrocardiogram and their abnormalities, cardiac irregularities and various clinical conditions.

Brevity seems to have been the author's watchword in writing this book. This has led to insufficient descriptions of electrocardiographic changes, i.e., in the description of extra-systole, no mention is made as to the time intervals between the P and R waves in auricular or nodal extra-systoles and no attempt is made to explain how to differentiate between a superior nodal extra-systole and an auricular extra-systole. The description of the Pardee curve or of the progressive changes in the electrocardiogram that take place after coronary thrombosis is meagre, and most of the changes enumerated as 'characteristic' of coronary occlusion can at the utmost be called 'suggestive'. Besides the changes enumerated have not been described in detail.

The author has attempted to steer clear of the controversial points in electrocardiography. But certain of his statements are certainly open to question. On p. 11, the diagram shows that the T wave takes place during ventricular diastole, while it is really systolic in time. In considering the measurement of the amplitude (voltage) of the QRS complex, the author recommends the measurements to be done in the tracing in lead II, but the modern method is to measure it in the lead where it shows maximum excursion. The normal limit of the amplitude of QRS is given as between 5 and 20 mm., this is in opposition to the standards laid down by Pardee, according to whom it should lie between 7 and 17 mm. and between 6 and 15 mm. if in one lead QRS is biphasic.

The book is profusely illustrated and a series of 25 case histories has been added in the last chapter. A useful appendix and a glossary and a bibliography of some recent contributions to electrocardiography (1916 to 1935) have been given. The get-up of the book is excellent.

P. C. S. G.

**INFANTILE PARALYSIS AND CEREBRAL DIPLEGIA—METHODS USED FOR THE RESTORATION OF FUNCTION.**—By Elizabeth Kenny. 1937. Angus and Robertson Limited (89, Castlereagh Street, Sydney), Australia. Pp. xvii plus 125. Illustrated. Price, 21s.

THERE are few conditions in children which arouse more sympathy than those of paralysis. A method of treatment of these conditions that claims more satisfactory results than those previously obtained is, therefore, welcome.

When the motor cells in the spinal cord are destroyed, an attempt to resurrect them and cure the permanent paralysis is almost futile. Reports, however, from medical men who have worked with Sister Kenny and from the medical officer appointed by the government of Queensland especially to investigate her methods of treatment state that she is able to bring about improvement in many cases abandoned by the profession and has obtained more rapid improvement in early cases not previously treated.

General principles of treatment of infantile paralysis laid down in this book consist of (i) maintenance of bright mental outlook, (ii) maintenance of impulse,

(iii) hydrotherapy and remedial exercises, (iv) maintenance of circulation and (v) avoidance of the generally accepted methods of immobilization.

Although the last principle is probably the one which lays itself open to most criticisms from the orthodox school, the arguments which Sister Kenny put forward in support of it and the success which appears to have attended her efforts demand some consideration.

Next, the author deals with the apparatus used in the treatment of infantile paralysis with practical details and original illustrations, followed by the description of the corrective measures for complications of old cases and remedial exercises for individual muscles.

The remaining part of the book is devoted to the consideration of cerebral diplegia. In this condition the principle of treatment is to encourage and help the patient to perform various useful movements and exercises, so that the dormant controlling influence will reawaken and gain strength. The results have been stated to be satisfactory especially if the cases are not long standing.

A foreword has been written by Professor Herbert J. Wilkinson and introductory notes by Mr. J. V. Guinarc, F.R.C.S. (Eng.), who has written the more scientific parts of the subject. The average practitioner can quickly grasp the methods followed in this book and apply them in the treatment of his own cases.

R. C.

**THE PHYSIOLOGICAL BASIS OF MEDICAL PRACTICE: A UNIVERSITY OF TORONTO TEXT IN APPLIED PHYSIOLOGY.**—By C. H. Best, M.A., M.D., D.Sc. (Lond.), F.R.S. (Canada), F.R.C.P. (Canada), and N. B. Taylor, M.D., F.R.S. (Canada), F.R.C.S. (Edin.), F.R.C.P. (Canada), M.R.C.S. (Eng.), L.R.C.P. (Lond.). 1937. Baillière, Tindall and Cox, London. Pp. xxi plus 1684 with 398 illustrations. Price, 45s.

It is undisputed that physiology plays a very important part in the practice of medicine, especially in helping the diagnosis, prognosis and the treatment of the cases. A knowledge of the principles underlying the diseased state is essential to the medical practitioner, to help him in the proper interpretation of the symptoms or in directing the proper and scientific line of treatment.

The authors are to be congratulated in bringing out this excellent book, the main purpose of which is to promote the development of a very close relationship between the laboratory and the clinic. It is needless to say that the labours of the authors in accomplishing this herculean task have been highly successful in clearly and fully establishing this relationship. The contributions of physiology to the progress of medicine, though recognized from very early times, have in no period in the history of medicine been of such paramount value as during the last few years and it is hardly possible to overstate its importance.

We, therefore, welcome the present volume, not merely as a standard work on physiology, meant for the laboratory workers, but because it is written in a clear, lucid and simple style which will give as much information as required not only to the general practitioners, house physicians and the senior medical students but also to the specialists so as to make them understand many of the intricate physiological problems, notably in carbohydrate metabolism, nutrition, endocrinology, etc., in the light of clinical medicine.

The authors have very ably drawn the clinical medicine into a common ground with physiology and biochemistry. We are unhesitatingly of opinion that the book is a valuable contribution to our up-to-date knowledge of the physiological principles in medical practice and should find a place in the library of every student of medicine.

J. P. B.

**FAVOURITE PRESCRIPTIONS.**—By Espine Ward, M.D. (Belfast). Fourth Edition. 1937. J. and A. Churchill, Limited, London. Pp. viii plus 156. Price, 7s. 6d.

IN the production of this edition of *Favourite Prescriptions*, which first appeared in 1926, Dr. Ward has revised and brought it into line with the *Addendum 1936 to the British Pharmacopœia 1932*. A number of new formulæ have also been added, mainly for children.

The contents of this volume are tables showing appropriate dosage for age; equivalents of weights and temperature; average age, weight and height; infectious diseases, regulations governing dangerous drugs act; official preparations with principal changes in the titles and strengths in the *British Pharmacopœia 1932*; and some hints on the treatment of poisoning. Besides, there is a large collection of prescriptions for various diseases or conditions arranged alphabetically. Many of them are taken from standard textbooks of medicine and therapeutics with such modifications as the author has found of value. While many of the prescriptions are very useful, some are of little or no value, for instance, treatment of ankylostomiasis with santonin, anæmia with small doses of iron, iron injections (with liver diet) in pernicious anæmia, and of acute gastric ulcer with dilute sulphuric acid and sulphates.

In the last chapter, there are some diet tables indicating, in a general way, the foodstuffs and drinks allowed and forbidden in a number of conditions. This is hardly of any practical use, besides dogmatic statements such as forbidding tea, white bread, and sweets in phthisis cannot be supported. Otherwise, the book is a useful compilation and will serve to refresh the memory of a busy physician.

R. C.

**THE FACIAL NEURALGIAS.**—By Wilfred Harris, M.D. (Cantab.), F.R.C.P. 1937. Oxford University Press, London. Humphrey Milford, 1937. Pp. xi plus 109 with 15 illustrations. Price, 7s. 6d. Obtainable from Oxford University Press, Bombay, India

THIS handy volume deals in detail with the anatomy, pathology, ætiology, signs, symptoms and treatment of the important neuralgias which occur in the facial region including paroxysmal trigeminal neuralgia. In spite of all the modern advances in medical science the basic problems of these nervous affections still remain unsolved and consequently the question of relief is far from satisfactory. It is for this reason that this volume, written by a physician of nearly 30 years' experience, will be read by everybody with considerable interest.

In the earlier section of the book the writer has dealt with the anatomical considerations with a pair of beautiful illustrations showing the origin, distribution and connections of the most important nerves responsible for facial neuralgias. The major portion of the book has been devoted to the considerations of 'tic douloureux' and all the accumulated experience of the writer during a very long period has been put forward. According to him the cause lies in the irritation of the terminal fibres of the sensory division of the trigeminal nerve due to dental sepsis. The medicinal treatment has been disposed of by a few lines indicating that this method hardly gives relief. More than 35 pages have been devoted to injection of alcohol into the nerve and the Gasserian ganglion as a method of treatment. The author having had a vast experience of this method of treatment has dealt with it in detail with regard to the technique of the operation and its after-effects with suggestions for the management of complications. The latter will be found to be particularly useful to those with lesser experience. The rest of the book contains short descriptions of the various other conditions giving rise to trigeminal neuralgia, i.e., trauma, herpes, neoplasms in the area of distribution of the fifth nerve, etc. The description of sympathetic neuralgia will be found to be full of interest and the writer's own observations in this connection may also

be consulted in the *British Medical Journal*. The printing, paper and illustrations have all been well executed by the publishers.

There are just one or two points which may be brought to the notice of the writer. An analysis of the results of his cases would be much appreciated for comparison as to the relative merits of each line of treatment. In his eagerness he appears to have carried the value of alcohol injection so far as to make us believe that 'the percentage of success should certainly be very little less than 100 per cent'. He also asserts beneficial results in certain cases of neuralgias by injecting the alcohol into the middle or the inner two-thirds of the ganglion. An operator must possess supernatural power to limit the quantity of the fluid and prevent the spread of the injected alcohol into other parts of the Gasserian ganglion producing anæsthesia over undesirable areas. But these are only minor points. The book is an extremely good one and should be read by every medical man.

M. N. D.

**TISSUE IMMUNITY.**—By Reuben L. Kahn, M.S., D.Sc. 1936. Baillière, Tindall and Cox, London. Pp. xix plus 708. Illustrated. Price, 34s.

THIS book deals in a clear and concise way with the rôle of tissues in immunity. It contains many features that should make this book of interest not only to immunologist and the bacteriologist but also to the practitioner of medicine. The book is divided into a series of 28 well-arranged chapters beginning with a discussion on the rôle of tissues in immunity and ending with a very lucid account on the practical aspects of tissue immunity. In each chapter after a general introduction of the particular subject under consideration there is a clear account of the experimental evidence, followed by a summary of results and clinical considerations. At the end of each chapter there are protocols illustrative of various experiments designed by Professor Kahn. These experiments are so presented as to be readily utilized for laboratory exercises in tissue immunity and both the medical student and the more advanced student of immunity will find them of the greatest interest.

The author has made quantitative studies on tissue immunity and by the use of relatively simple antigens has shown that antigens are fixed and gradually destroyed in the tissues of actively-immunized animals, and that immunity can be temporarily lost by the injection of a large dose of antigen. Further, that tissue immunity as evidenced by the sensitization of the skin in immune animals appears even before any antibodies can be demonstrated in the serum. The relation of tissue immunity and humoral immunity, the immunologic mechanism of infection, of protective inoculation, of skin tests, of vaccine and serum therapy are fully discussed in the book and well illustrated by experimental data.

This book would well repay careful perusal and will be of absorbing interest to those who would learn the mechanism involved in immunity.

C. L. P.

**OPERATIVE SURGERY.**—By J. S. Horsley, M.D., LL.D., F.A.C.S., and I. A. Bigger, M.D. Fourth Edition. 1937. The C. V. Mosby Company, St. Louis. Vol. I, pp. xvi plus 674, and Vol. II, pp. x plus 675 to 1387. With 1,259 illustrations. Price, \$15.00

THE fourth edition of Horsley's *Operative Surgery* has now been published, under the joint editorship of Drs. Horsley and Bigger, in a more convenient form in two volumes. This edition follows the same general lines as the previous ones and does not attempt to be an encyclopædic work. Many new operative procedures are described but 'none has been recommended which does not seem sound'. There are many new chapters, e.g., the chapter on the surgery of the acute abdomen, and much of the work on special subjects has not appeared previously in any other book. The authors,

however, have been fortunate in obtaining capable collaboration from their colleagues on special subjects.

Volume I consists of 41 chapters and 674 pages. The first 13 chapters, dealing with general surgical considerations, malignancy, and surgery of blood vessels, have been written by the senior author. Dr. Faulkner has contributed several chapters on bone surgery, but reconstructive operations on the hip joint have not been adequately discussed. The section on amputations has been dealt with by Dr. Bigger. The statement, that 'Lisfranc's amputation gives good results' may be disputed. To Dr. J. S. Horsley jr. has been assigned the section on plastic surgery. There is a chapter on 'face lifting', but for facial paralysis only the Blair operation of mechanical fixation has been described. With regard to lingual carcinoma, the opinion has been expressed that Blair's method of excision of the tongue should replace other operations for advanced cases. There is a subsequent chapter on the block dissection of cervical glands. Perhaps the operations on the thyroid and mammary glands might have been described at greater length. The concluding chapters, by I. A. Bigger on thoracic surgery, deserve careful perusal.

Volume II consists of 35 chapters and 712 pages. The sections on the heart, mediastinum and thoracic oesophagus are excellent. Chapter 47 deals with abdominal incisions. The transverse incision of Sloan and Singleton has been described in detail and for the exposure of the biliary tracts the Bevan incision has been extolled. It seems a pity that the better-known paramedian and vertical incisions have not been accorded the importance that they deserve. In the case of gastric surgery, a modification of Billroth I is described, which the authors believe should be used in partial gastrectomy whenever possible, because the duodenum is the normal receptacle of the gastric contents. The operation of Estes, disconnecting a gastro-enterostomy in jejunal ulcer, has been clearly described. Operations for megacolon have not yielded the desired results, although in the hands of Rankin and Learmonth section of the presacral and mesenteric nerves has been claimed to be successful. Adson, however, performs a lumbar sympathetic ganglionectomy and ramisectomy for this condition. In the case of the prostate, there is no mention of Harris's operation. The book concludes with some very interesting chapters by Dr. C. C. Coleman on head injuries and surgery of the central nervous system. The chapter on the autonomous nervous system by Dr. I. A. Bigger is equally interesting.

It now only remains to congratulate the authors on their excellent work. We have much pleasure in recommending this compendium to the practising surgeon. The printing, get-up and illustrations are all first rate. A comprehensive index is appended.

P. N. R.

**PREOPERATIVE AND POSTOPERATIVE TREATMENT.**—By R. L. Mason, A.B., M.D., F.A.C.S. 1937. W. B. Saunders Company, London and Philadelphia. Pp. 496 with 123 illustrations. Price, 25s. net

This book is intended to present a detailed consideration of the preparation and aftercare of surgical patients. In writing this book the author has called upon his colleagues to contribute chapters on subjects which lie within their special fields of interest. In consequence a very instructive and readable book has been produced.

It consists of two parts. Part I, dealing with general principles, comprises twenty-two chapters. The first few chapters are devoted to the consideration of the operative risk and management of patients with heart disease, hypertension, nephritis, and diabetes. The chapter on anaesthesia describes different methods and agents of anaesthesia, and the treatment of complications. Succeeding chapters deal with immediate postoperative care, shock, and blood transfusion. The important subject of water balance has also been carefully discussed. Other sections deal with acidosis and alkalosis, adynamic

ileus and acute dilatation of the stomach. Post-operative complications include those of the pulmonary and urinary tracts. Postoperative peritonitis, parotitis, and thrombosis have also received their due share of attention.

Part II is regional in its scope and consists of 12 chapters. It begins with the diseases of the ear, nose and throat. The management of a patient with hyperthyroidism has been very clearly discussed. An instructive chapter is devoted to the management of acute empyema thoracis and subphrenic abscess. The chapters on abdominal surgery are worthy of careful notice. The urological section includes kidney, bladder, and prostatic lesions. The last chapter is devoted to orthopaedic surgery. There is also an appendix dealing with normal chemical standards, which will be found useful.

This book begins with a quotation from Lord Moynihan, 'Surgery has been made safe for the patient: we must now make the patient safe for surgery'. We have no doubt that the author has succeeded in this difficult task. He has done well to emphasize the truism that the good surgeon is primarily a good physician.

This book, therefore, may be regarded as a *vademecum* by the aspiring surgeon, and this is no small praise for the book. As may be expected in a Saunderson's publication, the printing, get-up and illustrations are excellent. There is also an adequate index.

P. N. R.

**LOCALIZED RAREFYING CONDITIONS OF BONE—AS EXEMPLIFIED BY LEGG-PERTHES' DISEASE, OSGOOD-SCHLATTER'S DISEASE, KUMMELL'S DISEASE AND RELATED CONDITIONS.**—By E. S. J. King, M.D., D.Sc., M.S. (Melb.), F.R.C.S. (Eng.), F.R.A.C.S. 1935. Edward Arnold and Company, London. Pp. xii plus 400. Illustrated. Price, 35s.

THE basis of this book is an essay which won the Jacksonian Prize of the Royal College of Surgeons. It deals with the rather bewildering number of lesions known by such names as Perthes', Kohler's, Osgood-Schlatter's diseases, and many others less well known which are such a bugbear to the postgraduate. Added to the pathological aspect, there is included a very comprehensive review of modern views and teaching on bone physiology, together with a liberal bibliography for those requiring further reference. It should be of value to those treading the thorny path leading to Fellowship examinations.

J. C. D.

**INFECTIONS OF THE URINARY TRACT.**—By T. E. Hammond, F.R.C.S. 1935. H. K. Lewis and Company, Limited, London. Pp. x plus 250, with 3 figures and 3 charts. Price, 10s. 6d.

In his preface, the author states that this book should be regarded as a series of talks to practitioners by the bedside of the patient. It is written in the manner of a clinique rather than in that of a systematic lecture, and makes no claim to academic completeness. No opportunity has been lost to bring in a discussion of the general principles of surgical pathology, which is done in an interesting and discursive manner.

While the student usually disdains this type of book as having little examination value, the practitioner will find it interesting reading.

J. C. D.

**DIAGNOSIS AND NON-OPERATIVE TREATMENT OF THE DISEASES OF THE COLON AND RECTUM.**—By Gottwald Schwarz, M.D., Jacques Goldberger, M.D., and Charles Crocker, M.D. 1937. H. K. Lewis and Company, Limited, London. Pp. x plus 540 with 246 illustrations and 9 coloured plates. Price, 40s.

As its title implies this work is concerned with the diagnosis and medical treatment of disease of the large gut. While surgical measures have been extensively

dealt with in many excellent monographs by distinguished surgeons all over the world, the authors point out that owing to the recent progress in the fields of Roentgen diagnosis and procto-sigmoidoscopy a detailed consideration of non-surgical methods in diagnosis and treatment is only possible in a special book.

For this reason special attention has been paid to these two important factors in diagnosis—x-rays and procto-sigmoidoscopy.

There are preliminary chapters on anatomy, physiology, pharmacology and physical examination. Then comes the chapter on procto-sigmoidoscopy. This includes a detailed description of the use of the 'peplioscopic' sigmoidoscope.

The chapter on diagnosis by x-ray is a long one and covers the whole ground. There are many excellent diagrams and reproductions of skiagrams. This is worth perusal even by the expert radiologist.

The chapters on treatment resolve themselves into general and special. Under general methods is discussed the question of diet, massage, hydrotherapy (internal and external), electrical treatments, especially diathermy and treatment by radiation.

The remaining chapters are devoted to a discussion of diagnosis and non-surgical treatment of the various diseases of the colon, rectum and anus. In this section the various diseases are discussed under the headings ætiology, morbid anatomy, symptoms and treatment. The discussion though naturally short is surprisingly complete—all the newest drugs are mentioned.

In the discussion of the treatment of bacillary dysentery the surprising statement is made that 'all workers seem to agree that bacteriophage is of no value in treatment'.

Hæmorrhoids receive very full consideration—the treatment by injection is discussed in detail and full instructions given.

On the whole this book can be thoroughly recommended to the physician and radiologist as filling a niche in our knowledge of diagnosis and treatment of diseases of the colon and rectum.

J. A. S.

**HANDBOOK FOR MIDWIVES AND MATERNITY NURSES.**—By Mary Mayes, S.R.N., S.C.M. 1937. Baillière, Tindall and Cox, London. Pp. x plus 467 with 139 illustrations. Price, 8s. 6d.

THIS handbook has the merit of having been written from the nurse's point of view. The style is simple and direct and the difficult task of making the more scientific aspects of the subject intelligible to pupil midwives has been met by the use of illustrations from nursing experience. In this respect the book possesses a distinct advantage over several of the midwifery handbooks in current use. The writer has real understanding of the pupil's difficulties and succeeded in throwing light on several dark parts of the subject.

The tabular representation of much of the contents and the questions at the ends of the chapters will help the student, but the extreme simplification which has been attempted has resulted sometimes in inaccuracy or incompleteness and there are a few minor errors which will doubtless be corrected in later editions.

Useful additions to the main subject of the book are a chapter on the midwifery services in England and Wales and reference to the causes of maternal and infantile death. Emphasis is laid upon the importance of antenatal advice and particularly on diet in normal and abnormal pregnancy. Exercises in the puerperium are described. The responsibilities of the midwife in the homes of her patients and the modifications which may be necessary in giving advice to the very poor are some of the very practical points to which attention is directed.

This book is likely to become deservedly popular, and in spite of the fact that some parts of it refer particularly to practice in England it should make a

strong appeal to progressive teachers of pupil midwives in this country.

M. N.

**DISABILITY EVALUATION: PRINCIPLES OF TREATMENT OF COMPENSABLE INJURIES.**—By E. D. McBride, B.S., M.D., F.A.C.S. 1936. J. B. Lippincott Company, Philadelphia and London. Pp. xvi plus 623 with 374 illustrations. Price, 38s. Obtainable from Messrs. Butterworth and Company (India), Limited (Publishers), Calcutta. Price, Rs. 28-8

RECENT years have seen the publication of a number of books dealing with the problems of workmen's compensation. The volume under review comes from America and as is to be expected in a product of the J. B. Lippincott Company is sumptuously illustrated and in perfect type on beautiful paper. The author is assistant professor of orthopaedic surgery in the University of Oklahoma, and the meticulous detail and wide scope of the book suggest that his experience and the material at his command well qualify him for the task which he has attempted. The plan of the book is original and is built around the special problem of evaluating permanent partial disability in those difficult cases which do not at once fall into line with the terms of the schedule of compensation enacted by law.

Workers who are familiar with the act as operated in this country appreciate that the loss of an extremity by amputation simplifies assessment to the mere form of accepting the scheduled rates. Where however the limb is partially damaged but is still a useful member of the body experience, skill and a balanced sense of judgment are necessary if unfairness either to the employee or employer is to be avoided. No publication known to the reviewer meets the needs of a careful worker in this subject more searchingly than this.

The author's system of evaluating loss by an analysis of quickness, co-ordination, strength, security, endurance, safety of a workman, and prestige for re-employment is clarified by numerous tables. At first sight these tables are intricate and confusing but frequent references to actual cases soon make them simple in use. The first three chapters are devoted to a summary of the compensation laws in force in the United States and to the technique of examination with useful advice on dealing with malingerers. A third of the volume is then devoted to a valuable discussion on ankylosis of joints followed by ten chapters on fractures, their treatment and compensatory possibilities. The remaining seven chapters maintain the same high standard of scientific discussion on such difficult problems as the industrial back, head injuries, nerve injuries and the loss of visual acuity in their relation to compensation.

Unfortunately the price of the book is high—Rs. 28-8—and the reasoning in the text sufficiently close to make the reading heavy but it is a book which should be studied if much work in the assessment of injuries is undertaken. Some minor defects may perhaps be noted for future editions. Lasague's sign on page 78 is spelled Lasague's sign on page 107, both cannot be right. [Our dictionary gives Lasague.—EDITOR.] Gordon's, Oppenheim's and Chaddock's reflexes are referred to on page 86, but are neither described nor mentioned in the index. Aspirin per rectum is suggested before testing for pain in suspected malingering. If the subject agrees to a rectal insertion there seems no reason why it should not be given by mouth if it is to be of any use at all. Analogies are not infrequently drawn between mechanical structures such as girders and derricks and the framework of the body, while mathematical deductions from formulæ are offered for the study of muscular action. The practical value of these is doubtful. In contrast to the rest of the book the chapters on head and nerve injuries contain a number of confusing misprints. These minor defects are however unimportant in a sound and original contribution to the subject of assessment.

H. R. R.



**A HANDBOOK OF OCULAR THERAPEUTICS.**—By Sandford R. Gifford, M.A., M.D., F.A.C.S. Second Edition. 1937. Henry Kimpton, London. Pp. 341. Illustrated. Price, 18s.

This is the second edition of the handbook which is sufficient proof of its popularity and its usefulness. The first edition was written to provide a concise book on therapeutics, and the etiology and diagnosis of eye diseases were only discussed when they definitely related to treatment. Surgical treatment also was only mentioned in so far as it concerned the indications for operation, except for certain minor procedures.

The present edition contains much that is new, such as the vitamins and glandular extracts as they apply to ophthalmology, the use of heat and cold, contact dermatitis of the lids, certain types of keratitis and corneal dystrophy. There is also a short chapter on diseases of the orbit.

In textbooks of ophthalmology there is usually very little space devoted to the detailed treatment of disease, but in this handbook the author discusses very carefully the more recognized methods of treatment. Of special interest is the chapter on physical therapy in which is described and careful directions given on phototherapy, the therapeutic use of heat and cold, medical and surgical diathermy and finally Roentgen-ray and radium.

The chapter on the non-surgical treatment of cataract and glaucoma will be of interest to workers in India. There is no doubt that a very great proportion of the cataracts that are seen are toxic in nature and caused by foci of disease and disorders of nutrition and metabolism. The author describes various methods of non-operative treatment for cataract and very wisely is sceptical of the results claimed.

Likewise, the non-surgical treatment of the different types of glaucoma is discussed in detail, but his readers are warned at the beginning that most cases will sooner or later require surgical intervention. For India, at all events, the reviewer would strongly advise that the only treatment for glaucoma is surgical and more harm is done from postponing operative interference than from unsuccessful operations.

The book is dedicated to the author's eminent father, the late Dr. Harold Gifford, a distinguished ophthalmologist of his time. It is a very excellent and practical work and contains essentially the more important procedures which are often difficult to extract from larger textbooks. It is written in clear, simple style, well printed and excellently illustrated.

We recommend it as a valuable contribution to ophthalmic literature and will be of great practical value to ophthalmologists working in India.

E. O'G. K.

**PRACTICAL ORTHOPTICS IN THE TREATMENT OF SQUINT.**—By K. Lyle, M.A., M.D., M.Chir. (Cantab.), M.R.C.P. (Lond.), F.R.C.S. (Eng.), and S. Jackson. 1937. H. K. Lewis and Company, Limited, London. Pp. xiv plus 211 with 68 illustrations including 5 plates. Price, 12s. 6d.

The early treatment of squint by exercises to abnormal retinal correspondence and suppression is perhaps new to many doctors in India. Although some ophthalmologists do not regard orthoptic treatment with enthusiasm, yet the many volumes that have appeared recently on the subject encourage one that orthoptic treatment, provided it is carried out with patience and sympathy, can be done with very excellent results. It is, of course, futile to treat every type of squint by orthoptic treatment and it is the purpose of this book to point out which cases of squint are suitable for training and those in which treatment would be merely waste of time.

As the authors point out the old idea of correcting the refractive errors of squinting children and waiting until the age of 15 and 16 before operating is in most cases little short of neglect.

It is not claimed for orthoptic treatment that it will be found a substitute for the correction of refractive

errors nor for operation, although in a large proportion of cases it will cure a squint without recourse to surgical treatment.

The book is composed of fifteen chapters. The first deals with the management of the orthoptic clinic, the second with the instruments that are used in the clinic—the synoptophore, the cheiroscope, the myoscope and various stereoscopes. The third chapter deals with optical treatment; the fourth with occlusion. In this chapter the authors point out that if there is no improvement in the vision after a month and it is certain that the occlusion has been efficiently carried out, it is useless to continue it. That the average age of patients in whom occlusion has resulted in a satisfactory improvement in vision, that is to say, when the vision in the squinting eye has become approximately equal to that of the other eye, is 8½ years, although a few instances have occurred in which satisfactory results were obtained up to 16 years of age. The fifth chapter deals with method of examination in which the vision of each eye and binocular vision are determined and examination with synoptophore is explained. The sixth chapter deals with abnormal retinal correspondence and the authors impress its importance as it is on the correction of this condition that the whole of modern orthoptic work depends. The seventh chapter deals with simultaneous perception; the eighth chapter deals with fusion and stereoscopic vision; the ninth chapter deals with the principles of operation. Chapters ten, eleven and twelve are devoted to the classification of concomitant squint and their treatment. Chapter thirteen is devoted to heterophoria and its treatment. Finally, chapters fourteen and fifteen deal with paralytic squint and ocular torticollis.

The book is well illustrated and is written in a clear, simple style so that medical men not conversant with the subject will be able to understand the matter without much difficulty. It is regrettable, but nevertheless true, that the treatment of squint is greatly neglected in India and the importance of its early treatment not recognized.

We strongly recommend this eminently practical little book, not only to ophthalmologists, but to medical officers who have schools and children's clinics to look after.

E. O'G. K.

**GRADUATED MUSCULAR CONTRACTIONS—A SHORT DESCRIPTION OF PRINCIPLES AND TECHNIQUE.**—By Sir Morton Smart, K.C.V.O., D.S.O., M.D. 1936. Oxford University Press, London. Humphrey Milford. Pp. 31. Price, 2s. 6d. Obtainable from Oxford University Press, Bombay, India

GRADUATED muscular contraction as an aid to treatment of damaged, diseased or paralysed muscles and joints is well recognized in these days. In this small volume, the writer has brought forward all the physiological and pathological aspects on which such a treatment is based. The book is divided into two parts; in the first part the general principles of physiology of muscular contraction and the pathological changes brought about by inflammation have been discussed in detail and in a very simple but lucid way; in the second part the actual technique of the use of the instrument and the correct method of applying the treatment to the important individual muscles have been described.

Through this volume, the author who is an experienced worker has rightly emphasized that unless correctly applied and properly controlled this method of treatment by causing harm to already damaged muscles through faulty technique may lead to undesirable results. For this reason, this little volume will be read with advantage not only by those working in this line but also by every physician and surgeon who have occasion to recommend this treatment to their patients.

M. N. D.



**EMANOTHERAPY.**—By F. Howard Humphris, M.D. (Brux.), F.R.C.P. (Ed.), D.M.R.E. (Cantab.), and Leonard Williams, M.D. 1937. Baillière, Tindall and Cox, London. Pp. ix plus 188. Illustrated. Price, 7s. 6d.

THE term emanotherapy, as used in this book, refers to radon therapy, radon being the emanation or gas given off from radium. As a therapeutic agent, it has been used for about forty years, and yet is but little known in this country, although now employed in medicine abroad, especially on the continent, in many ways such as in the form of compresses, sprays, subcutaneous injections, baths, inhalations and drinking water.

The gas is present in many of the mineral waters at spas, and it is not improbable that the improvement in health that is obtained at these centres is due, in whole or in part, to the radio-activity of the air or waters. Apparatus is now available whereby emanotherapy can be given in hospital or home. By this means accurate doses of the gas can be administered in a way that has not hitherto been possible.

After the general and technical considerations of the subject the author deals with the various methods of application, the details of which have been given in subsequent chapters with diagrammatic illustrations. Although the method to adopt depends very largely on the merits of the individual case, the author finds it useful to combine several of them at the same time. For instance, in a case of gout or gouty arthritis one should employ subcutaneous injections, inhalation, ingestion, pomade to the affected part and if necessary, other measures of physical treatment for better and quicker results. This, however, does not sound very satisfactory and scientific. But the author has cited several chronic cases which responded well to the uses of emanotherapy alone. Other diseases in which this treatment has been used and found beneficial are certain gynaecological conditions, notably pelvic pain; skin affections, such as pruritus, eczema, etc.; respiratory diseases, especially chronic catarrhal conditions and affection of the sinuses; and various other conditions such as neurasthenia, debility, etc.

Once looked upon by the medical profession with distrust, this form of treatment appears to have now a definite place in physical therapy, and is likely to be used more extensively in the future. This small volume may fill a niche in literature of little-known remedies

and serve as an introduction of emanotherapy to the medical profession of this country.

R. C.

**NURSING AS A PROFESSION.**—By Esther Lucile Brown. 1936. Russell Sage Foundation, New York. Pp. 120. Price, 75 cents.

THIS book gives a very clear history of the progressive strides that nursing has gone through since the year 1870 year by year.

It should prove interesting reading to all interested in the medical profession but especially to those desirous of entering the nursing profession.

The statistics combined with an outline of the various branches of the work in which one may specialize are a veritable insight to what is being done by nurses all over the world.

The information regarding the national organizations is helpful and makes one realize the colossal amount of forethought and initiative which is gone through to improve the basis of the profession by the faithful pioneers of nursing.

Regarding the curriculum however, while we fully realize the vast importance of the necessity of the student nurses' knowledgeable acquirement of theory, we feel that nursing would become much more popular as a calling if the sheer practice of nursing were more stressed, and the theory and examinations rendered a little less terrifying and difficult, for there are few professions which bring such profound recompense to women as the joy of nursing care of the sick.

E. C.

#### OTHER BOOK RECEIVED

**Assessment of Risks in Life Assurance Practice.** By J. J. Cursetji, M.D., L.R.C.P., L.R.C.S., L.M.&S., F.C.P.S. (Bombay), J.P., Banoo Mansion, 130, Cumballa Hill, Bombay (6).

A reprint in pamphlet form of a paper read before the Third Indian Insurance Conference.

It contains information of interest to insurance doctors.

## Abstract from Report

### ANNUAL REPORT OF THE PUBLIC HEALTH COMMISSIONER WITH THE GOVERNMENT OF INDIA FOR THE YEAR 1934

(Continued from last issue, p. 388)

#### MATERNITY AND CHILD-WELFARE IN INDIA

Public attention is focusing more and more upon the continuing high rates of infantile and maternal mortality. Schemes of control are being pressed on local bodies and evidence is not lacking that the Public Health Departments, notably in Madras, Burma and the Punjab, are alive to their responsibilities.

In view of this increasing interest in the subject, a special report form was drawn up and circulated to all Directors of Public Health. Unfortunately the returns were not uniformly complete. But sound planning is impossible in the absence of fundamental data, and the first step towards placing maternity and child-welfare on sound basis is a survey in each province of the facilities existing for the care of the mother and child.

#### Vital statistics

The recorded provincial rates for maternal mortality are given below:—

		Urban	Rural
North-West Frontier Province	..	11.0*	..
Delhi	..	7.0	2.2
United Provinces	..	9.6	0.5
Bengal	..	9.0	9.4
Central Provinces	..	11.7	6.2
Bombay	..	9.1	5.1
Assam	..	15.1†	..
Burma	..	10.5	3.6
Madras	..	13.4	7.7

\* Peshawar town only.

† For 13 towns.

The usual practice of calculating maternal mortality is to base it on the number of registered births, excluding stillbirths. This method introduces certain fallacies. It is therefore suggested that in future the maternal mortality rate should be calculated on live and stillbirths.

In the tabular statement given above, the maternal death rate in urban areas is almost everywhere shown as greater than that in rural areas. The advantage may possibly be in favour of rural India, but it is certainly not so overwhelming as is suggested by these figures.

Probably the most accurate estimate of maternal mortality in India is that of Dr. Deshmukh in Madras city. He gives a rate of 16.6, but himself considers this on the low side. As it is, this is the highest rate recorded for any large city in India.

Sepsis accounts for practically the same proportion of deaths in England and Wales as in India. The sepsis mortality figure for Madras city, according to Dr. Mudaliar, is 29.6, almost equal to 29.7, which is the figure for England and Wales. In non-septic cases the variation is marked. Anaemia of pregnancy, which does not appear as a cause of death in England and Wales, assumes an importance in India second only to sepsis. The diarrhoea and dysentery groups among associated cases are of greater moment in India, and since they cause many disasters, the need for ante-natal treatment and care is apparent.

#### *Finance*

The proportion of the provincial resources allocated for maternity and child welfare varies from nil in Assam and Bombay to 9.3 per cent of the Public Health budget in the Central Provinces. The largest sum of money allotted by a local Government is Rs. 1,20,000 in the United Provinces.

In the Central Provinces and the United Provinces where the expenditure is the highest, large sums from the Provincial budgets are handed over to voluntary societies for expenditure. In Bihar and Orissa, the situation is somewhat similar, while in Burma the Red Cross advises on the distribution of Government grants.

Official Public Health Departments are making progress in organization, and the time has perhaps come in some provinces for a reconsideration of the policy of reliance on voluntary associations for work which should be an integral and vital part of the public health service.

The supply of well-qualified doctors and health visitors is still limited and salaries are consequently high and beyond the resources of local bodies. Unless grants are sanctioned by Government the tendency is for municipalities and district boards to employ untrained and poorly-educated workers who wreck the best-laid plans and bring welfare work into disrepute.

Burma and the Punjab not only aid in the training of health visitors for local work but also subsidize local bodies or societies employing a qualified staff, thus securing work of a high standard in aided centres.

#### *Training and employment of health visitors*

The health visitor is the most important single unit in the maternity and child-welfare services. On her personality, knowledge and skill the success or failure of child-welfare turns and her training is therefore a matter of utmost importance. In 1934 there were five health schools in India.

Of the major provinces, Bengal and the United Provinces have no course of training for public health nurses.

The number of welfare centres in England and Wales in 1934 was 2,884; the number in India is 684, of which North-West Frontier Province had 2, the Punjab 96, Delhi 26, United Provinces 166 excluding 13 subcentres, Bihar and Orissa 23, Bengal 41, Central Provinces 57, Bombay 81, Madras 153, Coorg 1, Assam 3 and Burma 22. The United Provinces heads the list in number but many of these are in charge of poorly-trained and untrained welfare workers. Educational work, which is the primary purpose of welfare centres, plays but a minor role in the activities of these centres, and a more accurate description of them would be midwifery centres. In Madras and the Punjab, the employment of untrained health visitors is prohibited. The establishment of 153 welfare centres in Madras and 96 in the Punjab, all engaged in preventing disease and doing health propaganda, is therefore a worthy achievement.

The number of health visitors employed in India is recorded as 206, only five of these being in Government service. A good service of qualified health visitors is a fundamental factor in all maternity and child-welfare schemes. Municipalities and local bodies contemplating the establishment of infant-welfare centres, says the Public Health Commissioner, would be well advised to defer their opening rather than start with unqualified workers who will at worst bring the schemes into disrepute and at best model the work on curative lines.

#### *The midwifery services*

Judged on a basis of one bed per 100 births and one midwife per 150 births, the provision of facilities for maternity cases is inadequate. The total number of special beds recorded was 3,162, but this is an underestimate, some provinces having reported the numbers as 'unknown'. The number of trained midwives is reported to be 2,187, and of trained *dais* 3,923.

Control and inspection of the work of qualified midwives vary greatly from no inspection at all to detailed control by officers of the medical and public health departments and voluntary societies.

Legislation designed to improve the standard of training, to regulate the issue of certificates, to establish and maintain registers and to supervise the work of midwives has been passed recently in 6 out of 11 provinces.

The number of hospitals in which the standard of training is sufficiently high to warrant recognition as schools for midwives and the number of midwives qualifying yearly are insufficient. Midwifery in the scattered villages and hamlets must remain in the hands of indigenous *dais* in the northern provinces, at least during the next two decades, and there is need in most provinces for a definite policy in regard to the training, registration and control of the *dai*. The Punjab is an outstanding exception. There the training of *dais* is being vigorously prosecuted, and trained *dais* are being registered under the Punjab Nurses and Midwives Act, 1932. This act prohibits untrained practice and can be enforced by the local authority or failing it by the Provincial Government whenever the local situation warrants this step.

One hopeful sign pointing to dissatisfaction with the existing order of things is that the older method of public health officers, sub-assistant surgeons and midwives instructing *dais* is being gradually replaced by the establishment of training centres run in conjunction with a maternity hospital or home and having an infant-welfare centre attached. This system is ideal because it affords the *dai* opportunity of acquiring experience in ante-natal work and in domiciliary as well as institutional methods of midwifery.

Too much emphasis cannot be laid on the training of *dais* and midwives because this is the first step towards ensuring that skilled service is available for all confinements.

The provision of maternity beds for cases of complicated pregnancy and labour and for patients with unsuitable home conditions is a further step which will follow almost automatically the establishment of skilled domiciliary midwifery. The demand for maternity homes for the middle classes is very insistent, and municipalities particularly are being pressed to provide and maintain such institutions from the rates. In Bombay hospitalization has reached the enormous proportion of over 70 per cent of confinements. This policy is questionable. Maternity hospitals and homes are more expensive to equip, to staff and to run than an efficient domiciliary midwife service conducted from a maternity hospital or run in conjunction with a maternity or welfare scheme, and there is no conclusive evidence that they provide for safer confinement.

The normal confinement can safely take place at home provided the surroundings are suitable, and municipalities may well pause and consider before they commit themselves to the building and staffing of expensive homes which will be used largely by a class who can afford to pay for the services of a doctor or midwife, while giving secondary place in the maternity

services programme to a municipal domiciliary midwife service reaching all classes of the community.

In conclusion, it may be said that the outstanding need of the maternity and child-welfare service in India to-day is expert medical control, developing, co-ordinating and directing all effort, voluntary and official, towards the one common goal of robust individual health and racial improvement.

#### FIGHTING INDIA'S DISEASES

##### *Hospitals and dispensaries*

At the end of 1934, there were in British India 6,597 hospitals and dispensaries, following the modern system of treatment, of which 1,356 were in Madras and 1,310 in Bengal. The Punjab possesses the next highest number, namely, 969; Bihar and Orissa is the fourth with 690; the United Provinces comes next with 686; and the number in Bombay is 533. On an average, 41,800 persons were served by each of these institutions, the averages for rural and urban institutions being roughly 58,500 and 12,000 persons, respectively. Of these institutions 5,202, or 79 per cent, were maintained either by Government or local authorities or both, and only a small number, *i.e.*, 545, or 8 per cent, were financed, managed or controlled by private organizations. Of the total, nearly four thousand and a quarter were in rural areas and the rest in urban. In rural areas facilities for medical relief remain very inadequate, the small province of Coorg standing out as the area in which rural medical relief is the most developed.

The number of beds available in all classes of institutions was nearly 72,000, of which 46,000 were for males and the rest for females. The number of patients treated was 75,500,000, of which 48,500,000 were males and the rest females. The low figures of females treated by no means connote relative healthiness of the female population but is ascribable partly to the prevailing *pardah* system and partly to the inadequacy of indoor accommodation for females.

Facilities for the treatment of women exist in all classes of institutions, but the numbers of hospitals and dispensaries exclusively for women are not very many. Those maintained or aided by Government or by local funds numbered 78 in the United Provinces, 41 in Madras, 40 in the Punjab, 14 in Bengal, 11 in the Central Provinces, 8 in Bombay, 5 each in 'Bihar and Orissa' and Burma, and 4 in North-West Frontier Province. Of these 206 institutions, 30 were state-public, 99 local and municipal fund, 74 private-aided. These hospitals and dispensaries are mostly located in headquarters and other urban centres and some provide only outdoor treatment.

##### *Income and expenditure*

The total income of hospitals classed as state-public, local and municipal fund, and private-aided, was during the year nearly Rs. 4,30,00,000, of which over Rs. 1½ crores came from contributions made by Government and nearly Rs. 1½ crores from contributions by municipal and local funds.

The total expenditure on these institutions was nearly Rs. 3½ crores, of which Rs. 95½ lakhs were on medical officers, Rs. 36½ lakhs on nurses, Rs. 30½ lakhs on diet, and Rs. 49½ lakhs on medicines.

##### *Medical personnel*

The medical personnel in different provinces during the year consisted of 179 Indian Medical Service officers, 90 Indian Medical Department officers, 32 Women's Medical Service officers, 1,750 salaried medical graduates, and 6,437 licentiates. The practice of associating selected private medical practitioners with the staffs of Government schools in an honorary capacity is gaining in popularity throughout the provinces. In addition, newly-qualified medical graduates and licentiates are being employed in increasing numbers as honorary surgeons and house surgeons in headquarters hospitals.

##### *Nursing services*

Progress in the development of nursing services is slow, largely on account of the lack of suitable

candidates and the relatively low esteem in which the profession of nursing is held amongst the middle-class Indians. As a result there is considerable shortage of trained nurses and the salaries are relatively high. It is gratifying to note, however, that in Madras the Nursing Service is more popular and many suitable candidates are said to be seeking training, each training centre having a waiting list. Burma, too, takes a high position amongst the provinces of India in respect of the quality of its nurses and midwives. During 1934, there were 3,697 nurses employed in hospitals, of which 3,486 worked in urban areas and 211 in rural. The nursing services in rural areas are developing very slowly. The total expenditure on nursing during the year in state-public, local and municipal fund and private-aided hospitals was Rs. 35½ lakhs for nearly 11 lakhs of indoor patients, the expenditure on nursing per case treated being Rs. 3-4-6.

*Subsidized practitioners.*—Considerable progress has been made during the preceding decade in extending medical relief to remote rural tracts, notably in the Punjab and Madras, by means of subsidies to private practitioners.

Here is an outline of the Punjab scheme:—

A private practitioner is placed in charge of a dispensary and is given Rs. 25 per mensem by way of a subsidy. The practitioner thus placed in charge of the dispensary is not liable to be transferred to another dispensary without his consent but in other respects is subject to the same conditions as the whole-time medical officers in charge of rural dispensaries. A whole-time dispenser, who is an employee of the District Board, is appointed to the dispensary on a salary of Rs. 25 per mensem, and a grant of Rs. 500 per annum is given for drugs and instruments. The total cost of such a dispensary is thus Rs. 1,100 against Rs. 2,500 of a rural dispensary under the existing scheme. The practitioner has to make his own arrangements for menial servants and for any miscellaneous expenditure connected with the dispensary. He is also entitled to charge for medicines supplied to patients other than the very poor in accordance with a scale which lays down the maximum chargeable in this manner.

In some other provinces also, schemes of medical relief on similar lines have been introduced to suit local conditions and requirements.

*Mental hospital.*—The census of 1931 places the number of insane persons in British India at nearly 98,000—60,000 males and 38,000 females. There were 19 mental hospitals for the housing of insane persons, which were maintained at a cost of about Rs. 35 lakhs during the year. These hospitals had accommodation for only 9,518 patients and could house during the year only 13,506 insane persons, of which nearly 10,500 were males and 3,000 females.

The apparent disparity between the incidence of insanity between males and females is stated to be attributable partly to the natural tendency to conceal female cases and partly to the fact that women, leading a more sheltered life, are less subject to anxiety and are less liable than men to indulge in excesses of various kinds.

Insanity is an affliction of the adult period, and an analysis of the total admissions into hospitals shows that 74 per cent were between 20 and 40 years of age, and nearly 60 per cent were Hindus and 21 per cent Mohammedans. The high incidence amongst females in these ages was evidently due to the strain of child-bearing; that among males corresponds to the period of entry into family life and the associated cares and worries.

Latest methods of treatment and skilled nursing are provided at the European Mental Hospital, Ranchi.

*Medical education.*—There are ten medical colleges in British India, of which Bengal, Bombay and Madras have 2 each, and the Punjab, Delhi, the United Provinces and Bihar and Orissa 1 each.

The medical schools in existence in British India number 28 and are distributed as follows:—Bengal 10, Madras 3, Bombay 5, United Provinces 2, Punjab 2, Bihar and Orissa 2, Burma 1, Central Provinces 1, Assam

1, and Central India 1. The Director-General, Indian Medical Service, in a note about these schools says that none of them have quite attained the desired standard and several are deplorably deficient, the two principal defects in most schools being overcrowding in the number of students and deficiencies in equipment.

*Research.*—Important researches and medical investigations during the year were conducted at the Central Research Institute, Kasauli, the All-India Institute of Hygiene and Public Health, Calcutta, the School of Tropical Medicine, Calcutta, the Haffkine Institute, Bombay, the King Institute of Preventive Medicine, Madras, the Pasteur Institute of India, Kasauli, the Pasteur Institute of Southern India, Coonoor, the King Edward VII Memorial Pasteur Institute, Shillong, the Burma Pasteur Institute and Bacteriological Laboratory. During the year, roughly 600,000 c.c.m. of prophylactic cholera, 350,000 c.c.m. of prophylactic T.A.B., 20,000 c.c.m. of prophylactic influenza vaccine, besides more than 10,000 doses of various other vaccines were issued from the Central Research Institute, Kasauli. The Institute also manufactured during the year nearly 6,000 tubes of anti-venine, 14,000 tubes of normal horse serum, and 1,000 tubes of high titre (diagnostic) serum.

*Indian Research Fund Association.*—In addition to the researches conducted at the Institutes named above, important investigations in malaria, plague, cholera, kala-azar, leprosy, nutrition, tuberculosis, vaccines and helminthology, besides numerous other enquiries were conducted under the aegis of the Indian Research Fund Association. The researches were of such far-reaching importance that it is difficult to pick out any in preference to others.

A large amount of material was collected for the study of post-epidemic conditions, endemic conditions and the effects of the Sukkur Barrage on the incidence of malaria.

Amongst the anti-malaria measures studied, there were Paris Green dusting in villages, use of larvicidal fish, destruction of larvæ in streams and irrigation channels and relative values of spraying mixtures for killing adult mosquitoes. Investigations were also conducted into the relative clinical efficacy of totaquina as compared with quinine, the effect of climate conditions upon the toxicity of plasmoquin, and now qualitative and quantitative tests were made for atabrin.

Experimental work was carried out on methods of testing the virulence of plague cultures and a standard test has now been devised. A study of the relative protective value of different plague vaccines was also made. The work on cholera bacteriophage was continued and the provisional conclusion was reached that the prophylactic administration of phage was effective in reducing the rate of attacks from cholera.

'Leprolin' was tried in the treatment of leprosy and in resistant cases with limited lesions it gave excellent results.

Investigations in nutrition included metabolic studies made to ascertain the extent to which cereal grains in common use in India favour or disfavour the retention of calcium, magnesium and phosphorus.

Amongst other enquiries mention may be made of the indigenous drugs and the drug addiction enquiries by Lieut.-Col. Chopra which have been in progress for a number of years.

*Medical intelligence.*—An account of the organized activities to combat disease cannot be complete without mention of the steps taken to obtain medical intelligence and to keep out diseases from India. The office of the Public Health Commissioner continued to function as the epidemiological bureau of the Government of India and issued epidemiological returns every week. India also actively participated in the activities of international health organizations, such as the Office International d'Hygiène Publique, Paris, the Singapore Bureau, League of Nations, Health Section of the League of Nations, Geneva, and the Congress of the Far Eastern Association of Tropical Medicines, held at Nanking, China, in October 1934.

Steps were also taken in the Ports of Bombay, Karachi, Calcutta, Madras and Rangoon and Aden to keep out diseases which might otherwise come in with travellers from abroad. For this purpose effective public health organizations were maintained at each of these ports. Recently, it may be remembered, elaborate quarantine arrangements have been put in operation at the air port of Karachi so that persons travelling from Africa, which is the endemic home of yellow fever, may not carry the disease into India. Should yellow fever happen to be introduced into India, the disease would be so appalling, says the Public Health Commissioner, that it might well cripple the country for a generation. An idea of the magnitude of the danger with which India was faced may be had from the fact that not only are all factors which make for a rapid spread of the disease present, but as a result of development of rapid aerial communication India is now only a few days distant in time from Africa and infected persons travelling by air from Africa can arrive in India well within the incubation period of the disease. Another danger is the possibility of infected mosquitoes being carried by aircraft travelling direct from Africa to India and stringent precautions are now enforced to eliminate this danger as far as humanly possible.

#### PUBLIC HEALTH SERVICES

There are signs on all hands that the 'sanitary idea' is beginning to penetrate the mind of India. The intensive public health propaganda carried out in most provinces during the last 10 or 12 years is beginning to bear fruit. Interest is increasing in such matters as rural reconstruction, nutrition, child-welfare, and the prevention of epidemics. This is the most welcome feature in the present situation. Public health cannot proceed much in advance of education, but it must be remembered that the best form of public education is the difficult administration of the public health services.

The total expenditure of the Central Government on Public Health Services during the year was nearly 14½ lakhs, of which a little over Rs. 4 lakhs were spent on public health establishment, nearly Rs. 4½ lakhs in grants for public health purposes, Rs. 2,90,000 on epidemic diseases, nearly Rs. 2 lakhs on bacteriological laboratories, Rs. 1,15,000 on public health works and nearly Rs. 2,000 on Pasteur institutes.

Provincial expenditure on public health activities during the year was nearly Rs. 1½ crores, of which nearly Rs. 60 lakhs were spent on public health establishment, Rs. 45½ lakhs in grants for public health purposes, Rs. 17½ lakhs on epidemic diseases, a little over Rs. 8 lakhs on bacteriological laboratories, Rs. 3½ lakhs on Pasteur institutes, and more than Rs. 10½ lakhs on public health works.

The expenditure province by province is as follows:—

North-West Frontier Province	Rs. 1,31,900
Punjab	10,29,391
United Provinces	20,44,069
Bihar and Orissa	9,96,146
Bengal	36,01,241
Central Provinces	3,51,303
Bombay	26,05,753
Madras	21,71,697
Coorg	7,224
Assam	6,68,812
Burma	8,79,087
Shan States Federation	36,899
Federation	

Public health propaganda was continued during the year, and no untoward outbreak of epidemic diseases occurred at any of the fairs that took place.

Amongst the provincial activities for the improvement of public health mention may be made of the following:—

Out of 48 districts in the United Provinces, the district health scheme was in force in 10. Work in rural areas included (a) the village aid scheme, (b) the appointment of resident public health officials for groups of villages, (c) the health unit, Partabgarh, and (d) rural reconstruction work. The village aid scheme

consists chiefly in providing 'village aid dispensaries', the training of 'village aiders', and in carrying out general sanitary improvements. The scheme was fully in force in 1,808 villages and partly in 5,036. The dispensaries numbered 3,378, these being aided by 'panchayat' boards, while the Provincial Branch of the Indian Red Cross Society provided funds for the initial equipment of many. The scheme of appointing resident public health staff was, as before, in force in Gorakhpur district only, the cost being met by the District Board. The Public Health Unit, Partabgarh, was continued in co-operation with the Rockefeller Foundation and the Provincial Branch of the Indian Red Cross Society. With the aid of funds provided by the Government of India and the local Government, a scheme of rural development in selected villages was formulated with a view to concentrating the efforts of the various interested departments on improving the physical and material condition of villages.

In Bengal the district health scheme was at work in 25 districts. All the 575 rural health circles in the districts, Darjeeling excluded, had trained sanitary inspectors, some having also assistant health officers. The expenditure on communications was Rs. 34 lakhs or 17 per cent, on water supply Rs. 6 lakhs or 3 per cent, on buildings Rs. 3½ lakhs or 2 per cent, on sanitation Rs. 17½ lakhs or 9 per cent, on vaccination nearly Rs. 2,40,000 or 1 per cent, and on drainage Rs. 30,000 or 0.1 per cent. Union Boards numbering 4,740, working under the village Self-Government Act, spent nearly Rs. 6½ lakhs or 7 per cent of their income on roads, Rs. 5,90,000 or 7 per cent on water supply, Rs. 68,000 or 1 per cent on drainage, Rs. 67,000 or 1 per cent on conservancy, and Rs. 1,62,000 or 2 per cent on dispensaries.

*Medical inspection of schools and colleges.*—As far back as February 1913, the Government of India pressed the need for instruction in hygiene in schools and for medical inspection of pupils and school premises, and a grant of Rs. 25 lakhs was made in this connection. Since that date practically all provinces have been teaching hygiene in their schools.

Arrangements for the medical inspection of school children are being developed in some provinces, notably the Punjab, Delhi, the United Provinces, Bihar and Orissa and Bengal. But in too many cases, these are confined to inspection and diagnosis and are not followed up by effective measures for treatment. These activities are controlled by the Provincial Education, Medical and Public Health Departments. Although there is apparently no lack of co-ordination, the absence of uniformity in the particulars supplied is conspicuous.

In North-West Frontier Province nearly 43,000 children were examined between July 1933 and June 1934. Over 14 per cent were found unclean, 15 per cent had dental disease, 10 per cent diseases of external eye, 6 per cent enlarged tonsils, 5 per cent enlarged spleen, 4 per cent defective vision, 3 per cent ear, nose or throat troubles, while 8 in every 1,000 children had skin disease. Out of nearly 17,000 found with defects, 82 per cent were treated, and 4,625 surgical operations were performed.

School dispensaries have not been provided, but a few simple medicines for minor ailments are kept in some schools. Mid-day meals were given to three schools in Peshawar and Bannu. Lectures were given to students on first aid, personal hygiene, prevention of diseases, formation of regular habits, etc.

In Delhi Province as a whole, of the boys examined 24 per cent were found to be suffering from trachoma, 21 per cent from enlarged tonsils, 15 per cent from defective vision, 10 per cent from gland diseases, and 8 per cent from malaria and diseases of teeth, whilst 11 per cent were found unclean.

In 252 schools in the United Provinces, 14 per cent of the children examined were found to have dental defects, 4 per cent pyorrhœa, 15 per cent tonsillar defects, 9 per cent eye diseases, 17 per cent defects of vision, 2 per cent lung disease, 1 per cent enlarged

spleen, and 4 per cent skin diseases, whilst 3 per cent had acquired deformities and 3 per cent were mouth breathers.

The 'central school dispensary scheme' drawn up by the Hygiene Publicity Bureau in 1933 was started this year in the towns of Benares, Agra, Lucknow, Cawnpore, and Allahabad. Owing to its success, it is proposed to extend it to eight other towns. Nearly 7,000 children attended these dispensaries.

About 700 scholars were fed on milk and free use of sprouting gram was continued.

In other areas, the school boys medical association provided treatment by opening dispensaries in seven schools in Gorakhpur.

No less than 4,000 first-aid dispensaries were at work in the province. In Benares, scholars have been classified into ages according to physical development and graduated exercises have been prescribed for various physical age groups.

Out of a little over 2,000 boys examined in Bihar and Orissa, 42 per cent had defects, the corresponding figures for girls being 78 per cent out of 485 examined. The majority of these, as usual, had skin troubles, enlarged spleens and carious teeth, 2.5 per cent of the boys suffered from common eye diseases, 7 per cent had visual defects and 3 per cent had heart disease.

In Bengal a total of 17,602 children were examined by medical officers in 161 schools. Of these, 19 per cent were ill-nourished, 13 per cent were badly clothed, 6 per cent had skin diseases, 12 per cent defective teeth, 3 per cent nasal disease, 11 per cent enlarged tonsils, 2 per cent adenoids, 4 per cent enlarged lymphatic glands, 2 per cent lung disease, 16 per cent eye disease, 2 per cent infectious disease, while 1 per cent were dumb. In height and weight the pupils compared unfavourably with recognized anthropometric standards.

Besides this, nearly a lakh and a half pupils were examined by rural sanitary inspectors in about 5,000 schools. Of these, nearly 42,000 were found to have enlarged spleens.

In Central Provinces and Berar, on an average nearly 1 lakh of children were examined each month. Of these 3 per cent were found unvaccinated, 1 per cent with enlarged spleen and 2.3 per cent suffering from contagious or other diseases.

The Bombay Presidency is still without a scheme for the medical inspection of schools, but of nearly 4,000 children examined in Sind for the purpose of ascertaining the vaccinal condition, 27 per cent were found with enlarged spleen.

#### *Industrial hygiene*

The total number of factories at work was 8,658, of which 4,023 were perennial and 4,635 seasonal. Nearly 70 per cent of the perennial factories were in the Presidencies of Bengal (1,139), Bombay (871) and Madras (720). In the Central Provinces, Assam and Burma factories were principally seasonal.

Considerable progress was recorded with housing schemes in the United Provinces, Bombay, the Punjab and Bengal. Improvements in ventilation were carried out in several factories in the Bombay Presidency, and the question of better methods of dust removal in metal polishing factories received attention. In Bengal, although lighting and ventilation were improved somewhat, many buildings in which small factories are housed were themselves the chief obstacle to progress. In Bihar and Orissa in some factories in which mechanical removal of dust was not feasible, isolation of the dusty processes was effected.

Progress in welfare work included the provision of a crèche and the supply of milk and barley to children in one factory at Calicut and weekly free distribution of rice to children in a tea estate in Madras Presidency. In the Bombay Presidency, the provision of crèches, the passing of the Maternity Benefit Act, and the development of maternity homes in recent years are some steps recently taken. In Bengal, welfare activities included improvement of housing, bathing and drinking water facilities, appointment of medical or welfare



staffs and recreation facilities for children. In other provinces also welfare work received attention.

So far as mining areas are concerned, welfare work took the shape of classes in first aid, and maternity and infant-welfare works. Little progress is, however, reported to have been made in housing and sanitation.

#### *Adulteration of food*

Adulteration of food continued to receive attention. But though public analysts have been appointed and laboratories for examination and analysis established, control of food adulteration is highly defective in most provinces, the legislation in many places being to all intents and purposes a dead letter.

Of 104 samples of ghee and 23 samples of milk examined in North-West Frontier Province, 42 per cent and 43 per cent were found adulterated. In the Punjab, 48 per cent of the water samples examined were found unfit for domestic use and 70 per cent of ghee samples submitted by local bodies were found adulterated. In the United Provinces, of nearly 6½ thousand samples analysed by the Government Public Analyst including samples of ghee, milk, oils, flour and butter, 24 per cent were found adulterated. In Bihar and Orissa adulteration was found in 62 per cent of ghee samples, 38 per cent of mustard oil and 75 per cent of sweets, and 99 per cent of milk examined. In Bengal, of 5,707 samples of foodstuffs analysed by the public health laboratory, 3,243 were received from districts and 1,496 from Municipal Boards. The percentage of adulteration was as follows:—

	District Boards	Municipalities
Mustard oil	18	19
Ghee ..	48	35
Milk ..	68	80
Butter ..	50	42
Dahi ..	100	80
Chhana ..	14	33
Atta and wheat flour	2	..
Tea ..	7	6

It is to be hoped that when a Central Board of Health is established, the question of control of food throughout India will be the first step taken. There is great need for uniform standards for many of the foodstuffs consumed. Not only is it desirable from the public health point of view but also from the point of view of trade, for if standards vary as between provinces, there must inevitably be interference with commerce and with the transport of food materials from place to place.

#### *Public health works*

So far as the public health works are concerned, the reluctance of local authorities to spend money on sanitary works is the first thing to attract attention. The contrast between Great Britain and India in this respect is very marked. In the former country, the importance of sound environmental hygiene was early recognized and the public health movement was therefore based on a sound foundation. In India the importance of environmental hygiene has not been fully recognized, and there is still considerable opposition towards the introduction of sanitary works which means the expenditure of money and therefore of an increase in taxation. The contrast is due mainly to the existence of a public opinion favourable to health improvement in Great Britain and to the lack of such opinion in India.

One or two features brought out in the provincial reports require special mention. Whereas a good water supply, sufficient in quantity and wholesome in quality, is the first essential, it is noted that not infrequently in towns funds are spent upon less important measures before a good water supply has been introduced. Again it is not infrequent to find that large sums are spent on roads, on hospitals or even on lighting before a safe water supply has been provided. Further, there are not a few municipal committees who hand over important executive functions, such as conservancy and rubbish disposal, to private contractors whose main

object is to make profit and it is rare to find satisfactory disposal of waste products carried out under such a contract system. Another feature constantly met with is the tendency to carry out town cleansing by night instead of by day. Such a system is not likely to be successful except in a modern town unusually well lit by electricity. Almost without exception, when conservancy is done in the dark, it is badly done and there is a great need in many towns for a switch over to daylight conservancy and town cleansing.

Taking the provision of protected water supplies as an index of the development of sanitary works, it is interesting to note that in Madras Presidency, out of 82 municipalities, only 41 have protected water supplies; in the United Provinces only six out of the eight first class municipalities having a population over one lakh, six out of ten second class municipalities having a population between 50,000 and 100,000, and three of the 28 of the third class with populations between 20,000 and 50,000 have piped water supplies. Thus in these three categories, 30 of the 46 principal towns lack the most essential amenity. The position in other provinces is very similar.

A new method of sanitary disposal and agricultural utilization of habitation waste has been evolved at the Institute of Plant Industry, Indore. The process involves very small expenditure and has been brought to the notice of all local governments and constituent states of the Imperial Council of Agriculture Research. This process or a modification of it suited to village conditions has been for some time past in the forefront of agricultural propaganda in the United Provinces. There, every government farm has adopted it, and it is said to have been taken up by a number of the bigger farmers, too.

#### *Expenditure on public health works*

During the year municipalities in British India, out of a total income of about Rs. 18 crores, devoted Rs. 3.87 crores, or 22 per cent, towards public health. In spite of the fact that there was a slight increase in the income of municipalities, the expenditure on public health showed a decrease. Municipal water supplies cost Rs. 1,13,00,000, conservancy Rs. 1,44,000, drainage Rs. 13,00,000. These totals were considerably less than those of the previous two years. The provincial expenditure on public health varied from the high figure of 45 per cent in Bengal Presidency to 10 per cent in Delhi. The percentage in other provinces was as follows: North-West Frontier Province 16, the Punjab 25, United Provinces 28, Bihar and Orissa 31, Central Provinces 26, Bombay 14, Madras 23, Assam 27 and Burma 18.

In the Punjab, the Sanitary Engineering Department had under construction ten public health projects on behalf of Government and 14 for local bodies. Piped water supplies are now in use in 43 towns. Arrangements for the collection, removal and disposal of excreta and street sweepings are still defective in many towns, although a little improvement has been made in a few where modern sanitary methods are being gradually introduced. To improve village water supplies, 1,600 parapet wells were constructed, 13,000 wells were cleaned and 2,000 hand pumps were installed. For the improvement of rural sanitation, nearly 1½ lakhs of rubbish heaps were removed outside villages, one lakh manure pits were dug, more than 1½ lakhs feet of pucca drains were constructed, 3½ lakhs of house ventilators were put in, nearly a thousand bore-hole latrines were made, and 500 sanitary sub-committees were formed.

Out of an income of about Rs. 2 crores, nearly Rs. 26½ lakhs were spent on public health, including Rs. 6 lakhs on water supplies and Rs. 30,000 on drainage.

In the Central Provinces, grants aggregating Rs. 22,000 were paid to certain municipalities to meet 50 per cent of the cost of the campaign against rats.

The Government in Bombay distributed grants amounting to Rs. 1 lakh for the improvement of water supplies. These grants, supplemented by allotments from local funds and private contributions, were spent on constructing wells, tanks, troughs and cisterns, in



repairing old wells and in boring operations. Altogether 491 new draw-wells were constructed and 134 step-wells were converted into draw-wells. Local bodies numbering 247 spent on public health works a little more than 4 per cent of their aggregate income of about Rs. 2 lakhs.

In Burma, in rural areas out of an aggregate income of nearly Rs. 1 crore, a sum of Rs. 8 lakhs only was expended on public health works. This total included Rs. 2 lakhs on conservancy, Rs. 1½ lakhs on markets and slaughter houses, and Rs. ½ lakh on water supply.

#### *Indian voluntary health organizations*

Of the voluntary health organizations, mention may be made of the Indian Red Cross Society, the St. John's Ambulance Association (Indian Council) and St. John Ambulance Brigade Overseas, the British Empire Leprosy Relief Association (Indian Council) otherwise known as 'BELRA', the Countess of Dufferin Fund and Women's Medical Service, Lady Minto's Indian Nursing Association, and the Bombay Presidency Public and Health Week Association, which have all been doing good work.

There were altogether 23 provincial and state and nearly 200 District Red Cross Committees at work at the end of 1934. Considerable progress was made during the year in the scheme which this society is carrying out in co-operation with the National Institute for the Blind, London, for the training of teachers in the prevention of eye diseases. The Maternity and Child-Welfare Bureau of the society also provides a central adviser on the subject of maternity for India.

The St. John Ambulance Association continued its instructional work and in the Bihar Earthquake the brigade performed admirable work in assisting the sick and the injured.

The activities of the 'BELRA' included research work, propaganda and publicity and training of doctors and survey and treatment of lepers. As a result of these activities there has been a considerable awakening of interest in the leper problem, and to-day there are available wider data as regards the incidence and endemicity of leprosy, increased means of rendering proper treatment to the leper, an effective publicity organization and a channel of educational propaganda to dispel ignorance about the disease and leprosy patients are seeking admission in increasing numbers. The seventeen branches which the association has are pushing on a campaign of anti-leprosy work within their areas with great vigour. Surveys have been held, dietetic experiments made and a large number of patients have been treated. The Burma branch reports that intensive local surveys have revealed twelve times more lepers than in the census of 1931. Madras is going ahead with its increasing number of clinics and the formation of district leprosy councils. A systematic survey of 150 villages in the district of Bankura in Bengal shows that more than 78 per cent of the villages are affected and one in every six families harbours leprosy cases and that on an average two out of every five cases are infectious. The most gratifying feature of the anti-leprosy work is the large number of cases that are now being released from hospitals and clinics either cured or improved.

## Service Notes

### APPOINTMENTS AND TRANSFERS

MAJOR-GENERAL I. M. MACRAE, C.I.E., is appointed as Deputy Director of Medical Services, Eastern Command. Dated 27th March, 1937.

Colonel D. C. V. Fitzgerald, M.C., is appointed as Officiating Deputy Director, Medical Services, Southern Command. Dated 5th April, 1937.

Lieutenant-Colonel J. A. S. Phillips, C.I.E., is appointed as Inspector-General of Civil Hospitals, United Provinces. Dated 22nd February, 1937.

Lieutenant-Colonel F. Stevenson is posted as Residency Surgeon, Kashmir. Dated 1st April, 1937.

Lieutenant-Colonel R. C. Clifford, M.C., is appointed Civil Surgeon, Simla-West. Dated 16th April, 1937.

Lieutenant-Colonel F. R. Thornton, M.C., Civil Surgeon, Dharwar, is appointed to officiate as Civil Surgeon, Poona, with attached duties, *vice* Lieutenant-Colonel R. H. Candy, proceeding on leave.

Lieutenant-Colonel J. M. Shah, M.B.E., Specialist in Venereal Diseases for the Bombay Presidency, Bombay, is appointed to officiate as Superintendent, J. J. Hospital, Bombay, and B. J. Hospital for Children, Bombay, in addition to his own duties.

Lieutenant-Colonel B. Z. Shah, Superintendent of Mahableshwar on the close of the Mahableshwar season is appointed to officiate as Civil Surgeon, Dharwar, with attached duties, pending further orders.

The services of Lieutenant-Colonel H. Williamson, O.B.E., have been replaced at the disposal of the Government of India in the Foreign and Political Department, with effect from the afternoon of the 16th March, 1937.

Lieutenant-Colonel R. Lee to be O. C., Indian Military Hospital, Sialkot.

Lieutenant-Colonel P. Savage to be O. C., Indian Military Hospital, Lansdowne.

Lieutenant-Colonel B. R. Chaudhri to be O. C., combined Indian Military Hospital, Thal.

Lieutenant-Colonel N. B. Mehta to be O. C., Indian Military Hospital, Meerut.

Lieutenant-Colonel J. M. Mitchell, O.B.E., to be O. C., combined Indian Military Hospital, Fort Sandeman.

Lieutenant-Colonel K. S. Master, M.C., to be O. C., Indian Military Hospital, Nowshera.

Major R. K. Tandon to be O. C., Labour Camp Hospital, Quetta.

Captain R. De Soldenhoff is appointed as Resident Medical Officer, St. George's Hospital, Bombay, with effect from the afternoon of the 16th March, 1937.

Captain J. H. Gorman to be O. C., Indian Military Hospital, Dharmasala.

Captain A. C. Taylor to be Surgical Specialist, Madras District, Bangalore.

Captain J. J. Barton to be O. C., Indian Military Hospital, Bakloh.

Captain M. H. Shah is appointed temporarily as Civil Surgeon, New Delhi. Dated 15th April, 1937.

Lieutenant Mohan Singh to be Specialist in Radiology, Waziristan District, Bannu.

### LEAVE

Lieutenant-Colonel B. F. Eminson, Civil Surgeon, Hyderabad, Sind, is granted leave on average pay for 7 months from 1st April, 1937.

Lieutenant-Colonel R. H. Candy, Civil Surgeon, Poona, is granted leave on average pay for 2 months and 28 days combined with leave on half average pay for 3 months and 18 days, with effect from the 24th April, 1937, or subsequent date of availing.

Lieutenant-Colonel S. S. Vazifdar, Professor of Medicine and Clinical Medicine and Therapeutics, Grant Medical College, Bombay, and Physician and Superintendent, J. J. Hospital and B. J. Hospital for Children, Bombay, is granted leave out of India for 4 months, with effect from 3rd July, 1937, or the subsequent date from which he avails himself of it.

Lieutenant-Colonel J. S. Galvin is granted by the High Commissioner for India an extension of leave for 1 month and 12 days in continuation of the leave granted to him.

## Original Articles

### SURGICAL TREATMENT OF NON-PARALYTIC SQUINT

By E. O'G. KIRWAN, F.R.C.S.I.

LIEUTENANT-COLONEL, I.M.S.

*Professor of Ophthalmology, Medical College, Calcutta*

It is now generally accepted that in the aetiology of concomitant or non-paralytic squint a defective fusion faculty is the prime factor, and this is accompanied by high refractive errors usually unequal in the two eyes. Hereditary influences and precipitating causes also play important parts. Treatment of this anomaly comprises:—

1. Refraction.
2. Prevention and correction of amblyopia.
3. Training of the fusion faculty.
4. Operative.
5. Stereoscopic training.

The treatment should begin as soon as the diagnosis is made, but, to get the best results, it should be carried out before the sixth year of life.

This article is only concerned with the operative treatment which I shall now discuss, and, as ophthalmic surgeons differ so widely in the surgical treatment, it is not unreasonable to suppose that no one operation is ideal. In India cases of squint come up for treatment at much later ages and extreme deviations are common. Cases may be divided into two main varieties:—

1. Convergent.
2. Divergent.

The former is more common; the latter occurs less often and usually late in life. Each of these varieties may be subdivided into monolateral and alternating types. In selecting the operative procedure for each individual case one must bear in mind that repeated operations are not desirable nor justifiable, and if possible the operation should be carried out on the muscles of one eye only. It so frequently happens that one eye is amblyopic and it should be emphasized that as far as possible the operation or operations should be limited to this eye. At the same time it should be pointed out that in correcting the deviation by one operation on one eye there should result no weakening of convergence or retraction of the eyeball. It should, however, be remembered that in very extreme deviations it may be necessary to operate on the two eyes. The operative treatment of squint usually consists of a combined lengthening and shortening of the opposing muscles. The old shortening operation or uncontrolled tenotomy should be no longer practised by the modern surgeon, and should be replaced by a central tenotomy or by the recession operation,

which consists in a re-attachment of the muscle further back on the sclera. Lengthening of the muscle as carried out in the so-called 'Worth advancement operation' in moderate degrees of squint is still advocated by many surgeons. The more usual types of surgical treatment carried out in the Eye Infirmary, Medical College Hospital, Calcutta, consists of:—

1. Resection with advancement combined with recession of the opposing muscle.
2. Resection with advancement combined with partial tenotomy.
3. Simple advancement or simple recession in moderate degrees of squint.

*Case 1.*—Miss A. G. S., age 28 years, Anglo-Indian. Convergent squint left eye. Duration since childhood.

*Vision.*—Right eye = 6/6. Left eye = 6/60 corrected  $\bar{c} + 6$  D. S. = 6/18, not further improved. Angle of squint  $20^\circ$ . Movements of the eyeball normal.

*Operation.*—Recession of left internal rectus, which was found to be much hypertrophied.

*Result.*—Excellent. Eyes straight.

*Case 2.*—Mrs. G., age 30 years, European. Alternating convergent squint. History of convergent squint since childhood. Hypermetropia  $+2$  both eyes.

*Vision.*—6/6 both eyes. Angle of squint  $35^\circ$ . Movements of the eyeball normal.

*Operation.*—Advancement of left external rectus and central tenotomy of internal rectus.

*Result.*—Excellent. Eyes straight.

*Case 3.*—B. R., age 4 years, European. History of squinting for about two years. Alternating convergent squint. Hypermetropia  $+2$ .

*Vision.*—Normal both eyes. Angle of squint  $45^\circ$ .

*Operation.*—Resection combined with advancement of left external rectus. Recession of left internal rectus. Squint corrected up to  $15^\circ$ .

*Result.*—Satisfactory.

*Case 4.*—S. C. N., age 16 years, Hindu male. Convergent squint right eye. Duration since childhood.

*Vision.*—Right eye 4/60, no improvement with glasses. Hypermetropia  $+3$ . Amblyopia. Left eye 6/12, not further improved. Hypermetropia  $+3$ . Angle of squint  $45^\circ$ .

*Operation.*—Resection and advancement right external rectus combined with recession of left internal rectus.

*Result.*—Excellent. Eyes straight.

*Case 5.*—A. S., age 23 years, Hindu male. Convergent squint left eye. Duration since childhood.

*Vision.*—Right eye = 6/18  $\bar{c} + 1.0$  D. S.  $+ 1.0$  D. cyl.  $45 = 6/6$ . Left eye = 6/60  $\bar{c} + 1.0$  D. S.  $+ 1.0$  D. cyl.  $90 = 6/18$ . Angle of squint  $45^\circ$ .

*Operation.*—Resection and advancement combined with recession of left internal rectus.

*Result.*—Good. Slight deviation  $15^\circ$ .

*Case 6.*—Miss E. C., age 20 years, European. Convergent squint left eye. Duration since five years of age. Has been using glasses since childhood.

*Vision.*—Right eye = 6/12  $\bar{c} + 1.5$  D. S.  $+ 0.75$  D. cyl.  $180 = 6/6$ . Left eye = 6/24  $\bar{c} + 1.5$  D. S.  $+ 1.0$  D. cyl.  $180 = 6/12$ . Angle of squint  $45^\circ$ .

*Operation.*—Advancement of left external rectus combined with recession of left internal rectus.

*Result.*—Angle of deviation reduced to  $20^\circ$ . A month later second operation. Advancement of the right external rectus.

*Final result.*—Eyes straight.

*Case 7.*—Miss T., age 16 years, European. History of concomitant convergent squint of left eye since childhood.

*Vision.*—Right eye =  $6/6$  H.m. +  $0.75$ . Left eye =  $6/6$  H.m. +  $0.75$ . Angle of squint  $45^\circ$ . No binocular vision. Movements of the eyeball normal.

*Operation.*—Resection and advancement of left external rectus, combined with recession of left internal rectus.

*Result.*—Excellent. Both eyes straight.

*Case 8.*—A. S., age 17 years, Hindu female. Alternating concomitant convergent squint. History of left eye deviating since childhood.

*Vision.*—Right eye =  $6/12$  c +  $2.25$  D. S. +  $1.5$  D. cyl.  $30^\circ$  =  $6/6$ . Left eye =  $6/18$  c +  $3.25$  D. S. +  $1.0$  D. cyl.  $35^\circ$  =  $6/6$ . Angle of squint  $45^\circ$ . No binocular vision. Movements of the eyeball normal.

*Operation.*—Resection and advancement of left external rectus, combined with recession of left internal rectus.

*Result.*—Satisfactory. Angle of squint reduced to  $20^\circ$ .

*Case 9.*—M. M., age  $4\frac{1}{2}$  years, European boy. Extreme alternating internal strabismus. Angle of deviation  $45^\circ$ . Hypermetropia +4. History of right eye squinting since he was three years of age. Has been wearing glasses for one year.

*Vision.*—Right eye =  $6/12$  c +  $3$  D. S. =  $6/9$ . Left eye =  $6/12$  c +  $3$  D. S. =  $6/9$ .

*Operation.*—Resection and advancement of right external rectus combined with recession of right internal rectus.

*Result.*—Excellent. Eyes straight with glasses.

*Case 10.*—O. A., age 10 years, Anglo-Indian girl. Concomitant convergent strabismus left eye. Angle of deviation  $40^\circ$ . Left eye amblyopic.

*Vision.*—Right eye =  $6/18$  c +  $3.0$  D. S. =  $6/6$ . Left eye =  $2/26$  c +  $4.0$  D. S. =  $5/60$ . Movements of the eyeball normal.

*Operation.*—Resection and advancement of left external rectus combined with recession of right internal rectus.

*Result.*—Eyes straight.

*Case 11.*—L. L., age 18 years, European girl. Extreme concomitant divergent squint left eye. History of the left eye deviating outwards since she was a little girl. Movements of the eyeball normal.

*Vision.*—Right eye =  $6/18$  c —  $1.0$  D. S. +  $2.0$  D. cyl.  $90^\circ$  =  $6/6$ . Left eye =  $6/24$  c —  $1.5$  D. S. +  $2.0$  D. cyl.  $90^\circ$  =  $6/6$ . No binocular vision.

*Operation.*—Resection and advancement of left internal rectus combined with recession of left external rectus.

*Result.*—Excellent. Eyes straight.

*Case 12.*—P. S. G., age 28 years, Bengali Hindu, medical man. Extreme concomitant divergent squint left eye. History of left eye deviating since he was five years of age. Movements of eyeball normal.

*Vision.*—Right eye =  $6/36$  c —  $1.5$  D. S. —  $0.75$  D. cyl.  $30^\circ$  =  $6/6$ . Left eye =  $6/30$  c —  $2.0$  D. S. —  $0.5$  D. cyl.  $150^\circ$  =  $6/6$ . No binocular vision.

*Operation.*—Resection and advancement of left internal rectus combined with recession of left external rectus.

*Result.*—Excellent. Both eyes are straight.

### Summary

In Bengal extreme degrees of concomitant squint both convergent and divergent are very common. They can truly be labelled as 'monuments of neglect' for treatment is most satisfactory. The convergent varieties can always be cured and in the case of divergent ones excellent results can be obtained provided the vision is good in each eye.

In eleven of the twelve cases recorded the results were obtained by a single operation on the muscle of one eye.

## A COMPARATIVE STUDY OF THE ACTION OF ATEBRIN AND ATEBRIN-PLASMOCHIN COMBINATION ON INDIAN STRAINS OF MALARIA

### PART II

By R. N. CHOPRA, C.I.E., M.A., M.D. (Cantab.),  
M.R.C.P. (Lond.)

BREVET-COLONEL, I.M.S.

Honorary Physician to H. M. The King

R. T. M. HAYTER

and

B. SEN, B.Sc., M.B.

(From the School of Tropical Medicine, and Carmichael Hospital for Tropical Diseases, Calcutta)

IN the attempt to find some drug that will effect a permanent cure in malaria the medical profession in this country has started using combinations of different anti-malarial remedies. Tablets containing these combinations in various proportions have been put on the market by well-known firms and are being extensively used. For instance, plasmochin has been combined with quinine and atebirin in various proportions.

Although the action of plasmochin has been fully investigated by various workers and the drug has finally been shown to act chiefly, in non-toxic doses, on the sexual phase of malignant tertian malaria, a strong belief still exists among the profession that plasmochin possesses marked curative properties in the same way as atebirin or the cinchona alkaloids, and that it is even effective in preventing relapses. This view has been utilized by Messrs. Bayer-Meister Lucius in putting two combinations of atebirin and plasmochin on the market. They have been made in the form of dragées, one containing  $0.1$  gm. of atebirin and  $0.0033$  gm. of plasmochin and the other containing the same dose of atebirin but  $0.005$  gm. of plasmochin. The idea underlying these combinations was that plasmochin by its schizonticidal property would help the action of atebirin considerably and thereby reduce the relapse rate. The dosage of plasmochin has been kept within safe limits so that, if it fails to act on the asexual stage, it will produce its crescenticidal action all the same without producing any untoward effects. Chopra, Gupta and Sen have made a comparative study of the effects of one of these combined preparations (containing  $0.0033$  gm. of plasmochin) and of atebirin by itself on a series of 54 cases in the Carmichael Hospital for Tropical Diseases and have shown that—

(1) In cases of benign tertian and quartan malaria, the combination is not more effective than atebirin alone in so far as the time of disappearance of the parasites from the blood is concerned. In the case of malignant tertian infection, however, the combination appears to

PLATE XXII

Case 2.



Before operation.



After operation.

Case 3.



Before operation.



After operation.

Case 4.



Before operation.



After operation.

PLATE XXIII

Case 5.



Before operation.



After operation.

Case 6.



Before operation.



After operation.

Case 7.



Before operation.



After operation.

be more effective and the parasites disappear more rapidly from the peripheral circulation.

(2) The relapse rate is definitely lower in cases where the combination of the two drugs is used than with atebirin alone, in all forms of infections.

(3) The combination of the two drugs is more toxic than atebirin alone.

In this paper we have embodied the result of our investigation on the effect of the other combination containing 0.005 gm. of plasmochin as compared with atebirin by itself on Indian strains of malaria. The idea was to determine if the higher dose of plasmochin in combination is more effective, so far as the relapse rate is concerned, and whether any toxic effects are produced by such combination. During these studies the effects produced by the drug were particularly observed—

(1) On the sexual and asexual forms of the parasites and the time taken for their complete disappearance from the peripheral blood.

(2) On the relapses.

(3) On the splenic enlargement.

(4) On the function of the liver.

(5) In producing toxic effects.

The investigation was carried out on a series of 45 cases admitted into the Carmichael Hospital for Tropical Diseases and the results were compared with those obtained on a previous series of cases treated with atebirin alone.

Patients suffering from malaria were admitted under the senior author and a thorough physical examination was conducted immediately after admission. Except in urgent cases the anti-malarial treatment was not commenced until the parasites were properly identified and the parasitic counts were fairly constant for two or three febrile days. Daily examination of the blood during this period enabled us to watch the progress of the cases and gave us information regarding the intensity of the infection. If the parasites in the

peripheral blood were scanty, they were allowed to increase till the counts were fairly high and the rigor and other symptoms were marked. Whenever possible, sugar tolerance and van den Bergh's tests were done both before and after the course of treatment in order to determine if atebirin and plasmochin, when given in combination, produced any deleterious effect on the functions of the liver.

When all these preliminary investigations were completed the drugs were given by the mouth, one dragée (containing 0.1 gm. of atebirin and 0.005 gm. of plasmochin) three times a day for five consecutive days being the usual doses for an adult. No other drug was given except a mild purgative whenever necessary. As regards diet, only the usual restrictions for a febrile condition were observed. During the course of treatment daily examinations of the blood were carried out and, whenever possible, a rough estimate was also made of the number of parasites per c.mm. of blood.

After the completion of the treatment, the patients were carefully observed in the hospital for at least a fortnight and daily examinations of blood for malarial parasites were conducted during this period. If thick and thin films showed no parasites, cultural examinations of the blood were finally made before the patients were discharged. If routine laboratory examinations revealed any other infection, *e.g.*, dysentery, helminthiasis, etc., these were treated during the period of observation.

### Discussion of results

Chopra, Das Gupta and Sen (1933) have studied the effects of atebirin on the Indian strains of malaria and the results obtained in that series have been analysed for purposes of comparison along with those obtained with atebirin-plasmochin dragées in this series.

A perusal of table I will show that the atebirin-plasmochin combination acts both on the asexual and the sexual stages of all the three

TABLE I

*A statement showing the species, number of cases treated and the number of days required for complete disappearance of parasites from the peripheral blood after the commencement of the treatment*

Species of parasites	COMPLETE DISAPPEARANCE OF PARASITES FROM PERIPHERAL BLOOD											
	Number of cases studied		On the 3rd day		On the 4th day		On the 5th day		On the 6th day		In more than 6 days	
	A + P	A	A + P	A	A + P	A	A + P	A	A + P	A	A + P	A
Benign tertian .. .. .	14	11	5	6	6	4	2	1	1	0	0	0
Malignant tertian .. .. .	20	18	8	3	8	2	2	6	2	2	0	6
Quartan .. .. .	3	5	0	1	1	1	0	0	1	0	1	0
Mixed benign tertian and malignant tertian .. .. .	7	3	0	0	4	1	2	0	1	0	0	2
Mixed benign tertian and quartan .. .. .	1	0	0	0	0	0	0	0	1	0	0	0

A = Atebrin; P = Plasmochin



species and that the time taken for the complete disappearance of *P. falciparum* and *P. vivax* is usually two to four days. A delayed response was, however, obtained in a small percentage of cases, the parasites disappearing five days after the commencement of treatment. In infections with *P. malariae*, the destruction of parasites was quite slow; 66 per cent of the cases took more than six days for the parasites to disappear from the peripheral blood.

A comparative study of the effects of this combined preparation of atebtrin-plasmochin and atebtrin alone shows that, in cases of infection with *P. vivax*, the disappearance of the parasites by both methods of treatment is complete in the majority of the cases within four days, whereas with malignant tertian infection the combination removes them in a shorter time than atebtrin alone. The reason of this will be obvious from a perusal of table II which shows that atebtrin does not act on the crescents and consequently the sexual forms persist even after the course of treatment is over. In quartan malaria, atebtrin alone produces even more rapid action than the atebtrin and plasmochin combination.

Table II gives an idea of the comparative efficacy of these dragées on the asexual and the sexual forms of the different species. In benign tertian infection, the sexual forms are more rapidly affected than the asexual, but in the case of malignant tertian this treatment produces practically the same effect on both forms. As regards quartan, the number of cases was unfortunately too small to enable us to form any accurate conclusions; the gametocytes seem to disappear more quickly than the asexual forms. The comparatively rapid destruction of the benign tertian gametocytes may be partly explained by their tendency to spontaneous disappearance.

A comparison of the effects of atebtrin alone with those of the combination dragées shows that atebtrin produces a more rapid action both

on the asexual and sexual forms of *P. vivax*, but in the case of *P. falciparum*, although it removes the asexual forms in the majority of cases within a short time, the sexual forms are rarely touched and persist even after the course of treatment is completed. In the case of *P. malariae*, atebtrin alone appears to be as effective or even superior to the combined dragées with regard to their action on both the asexual and sexual forms.

Table III shows that there is no relationship between the parasite count and the number of days required for the complete disappearance of the parasites. A perusal of this table will show that both the drugs behave in more or less the same way with regard to the relationship between the parasite count and their disappearance from the peripheral blood.

*Relapses.*—Out of a total of 39 cases treated with atebtrin alone, 5 apparently relapsed while still under observation in the hospital. Out of 45 cases treated with the combination only 2 (1 *P. falciparum* and 1 *P. vivax*) relapsed. This shows that the relapse rate is 12.5 per cent in the case of atebtrin and 4.4 per cent in the case of the combination. The series of cases is very small, but in view of the fact that these trials were carried out under fully-controlled conditions, the results are worthy of note.

*Spleen.*—So far as the effects on the spleen are concerned a soft spleen rapidly contracts when the patient is put on either treatment and the fever subsides. No difference could be observed in the case of the two treatments in this connection. The hard spleen of chronic malaria showed very little alteration.

*Effect on the liver function.*—Lævulose tolerance and van den Bergh's tests were performed on a small series of 7 cases. A perusal of table IV will show that out of these 7 cases 4 showed an already defective liver. The function of the liver, in the remaining 3 cases, was found to be normal both before and after the course of treatment.

TABLE II

The comparative efficacy of the drug on sexual and asexual forms of different species

Species of parasites	SEXUAL FORMS						ASEXUAL FORMS					
	Number of cases where present		Number of cases where they disappeared within 4 days		Number of cases where they disappeared in more than 4 days		Number of cases where present		Number of cases where they disappeared in 4 days		Number of cases where they disappeared in more than 4 days	
Benign tertian .. ..	A + P	A	A + P	A	A + P	A	A + P	A	A + P	A	A + P	A
Malignant tertian ... ..	9	7	8	7	1	0	15	11	12	11	3	0
Quartan .. ..	10	9	4	1	6	8	21	18	17	18	3	0
	2	4	1	4	1	0	4	5	0	5	4	0

A = Atebtrin; P = Plasmochin

TABLE III

A statement showing the parasite count and the number of days required for disappearance of parasites

Species	WITH ATEBRIN + PLASMOCHIN		WITH ATEBRIN ALONE	
	Parasite count on the day of commencement of treatment	Number of days required for complete disappearance of parasites from peripheral blood	Parasite count on the day of commencement of treatment	Number of days required for complete disappearance of parasites from peripheral blood
Benign tertian .. ..	(1) 10,000	3 days	(1) 10,020	4 days
	(2) 18,500	2 "	(2) 16,820	3 "
	(3) 7,500	3 "	(3) 30,000	2 "
	(4) 5,600	2 "	(4) 28,000	1 day
	(5) 21,000	5 "	(5) 21,400	3 days
Malignant tertian .. ..			(6) 9,840	2 "
			(7) 10,000	3 "
	(1) 8,000	3 days	(1) 9,240	More than 6 days
	(2) 5,100	2 "	(2) 3,840	"Only" 6 "
	(3) 740	2 "	(3) 14,200	"Only 4 days"
Quartan .. ..	(4) 9,000	4 "	(4) 128,000	More than 6 days
	(5) ..	6 days	(5) 13,000	Only 6 days
	(1) 650		(1) 3,520	3 days
			(2) 1,000	3 "
			(3) 800	2 "
			(4) 2,400	3 "

TABLE IV

A statement showing the function of the liver before and after treatment

Species	LIVER FUNCTION TESTS	
	Before treatment	After treatment
Benign tertian ..	Moderately defective.	Moderately defective.
" " ..	Normal	Normal.
Malignant tertian ..	Slightly defective	Not done.
Quartan ..	Normal	Normal.
Malignant tertian	Slightly defective	Slightly defective.
" " "	" "	Normal.

*Untoward symptoms.*—Untoward symptoms were produced in a large number of the patients of this series. The symptoms were as a rule mild, but in four patients, they were so severe that the treatment with combination dragées had to be stopped. One patient with malignant tertian infection developed the usual toxic effects after eleven doses of atebriin and plasmochin and looked cyanosed and collapsed. Stimulants had to be given and atebriin and plasmochin dragées had to be replaced by quinine. Another case of malignant tertian infection became very restless on the second day of treatment. The patient developed difficulty of breathing and the pulse rate went up to 120 per minute with a temperature of 99°F. The treatment with the combined preparation was stopped and bromides were administered

after which the patient improved. He was put on plain atebriin from the following day. In 2 cases of benign tertian infection precordial distress was felt after the use of the combination dragées and they had to be stopped in the middle of the course of treatment. Two patients complained of slight epigastric pain and flatulence but could complete the course of treatment. Yellow pigmentation of a mild character of the whole body was observed in quite a number of the patients. The pigmentation disappeared in the course of a few days in some cases but in the majority slight yellow coloration persisted even up to the time of discharge from the hospital. From a careful study of the three series of patients we have formed the opinion that toxic coloration is somewhat more frequent with the combined preparation than with atebriin alone.

#### Summary and conclusions

(1) Comparative studies have been carried out in a small series of 45 cases on the therapeutic effects produced by atebriin alone and atebriin-plasmochin dragées (containing atebriin 0.1 gm. and plasmochin 0.005 gm.).

(2) In cases of benign tertian and quartan malaria, the combination of the two drugs is not more effective than atebriin alone in so far as the time of disappearance of the parasites from the blood is concerned. In the case of malignant tertian infection, however, the combination appears to be more effective and the parasites disappear more rapidly from the peripheral circulation.

(Continued at foot of next page)

## A STABLE SOLUTION OF ANTIMONY FOR THE TREATMENT OF KALA-AZAR

By L. EVERARD NAPIER, M.R.C.P. (Lond.)

*Acting Professor of Tropical Medicine and Officer in charge, Kala-azar Enquiry under the Indian Research Fund Association*

R. N. CHAUDHURI, M.B. (Cal.)

*Assistant Professor of Tropical Medicine and*

M. N. RAI CHAUDHURI, M.B. (Cal.)

*Clinical Assistant, Calcutta School of Tropical Medicine*

No apology is needed for an enquiry into the therapeutic efficacy in kala-azar of an antimony

(Continued from previous page)

(3) With regard to the relationship between the number of parasites and their disappearance from the peripheral circulation, atabrin alone and atabrin-plasmochin dragées behave in the same way.

(4) The relapse rate is somewhat lower in cases where the combination of the two drugs is used than with atabrin alone, in all forms of infection.

(5) There appears to be no difference in the two so far as the reduction of the size of the spleen is concerned.

(6) The combination of the two drugs is more toxic than atabrin alone.

(7) Distinct advantage can be gained by treating cases of malignant tertian infection with the combination dragées, especially when the sexual forms are present. In the case of benign tertian and quartan infections they appear to have no particular advantage.

It is fully realized that the series of cases dealt with in this paper is very small and that the conclusions can only be provisional. We are grateful to Messrs. Bayer-Meister Lueius and Dr. Broeke for supplying the dragées free of charge for these trials.

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compound. During the last two decades advances in the treatment of this condition have turned a 95-per-cent mortality into a 95-per-cent (at least) recovery rate. This is not an unimportant achievement in a disease from which at certain times as many as a million people may suffer in one country alone. Many valuable drugs have been discovered for the treatment of this disease, but none, in our opinion, is superior to neostibosan, which has now had a world-wide trial in this disease for over a decade. Remarkable though its effects are in a case of kala-azar, one would hesitate to predict that it was likely to be the last word in the treatment of this disease. One disadvantage it suffers is that dissolved in distilled water it does not make a very stable solution and it cannot therefore be supplied as a solution, but has to be issued in dry form in sealed ampoules which should be dissolved shortly before use\*. There are obvious advantages in having the drug in fluid form ready for immediate administration.

*The new compound.*—No. 561 is a clear, sterile, colourless solution which is said to be stable. It is a pentavalent compound of antimony and it contains 20 mgm. of antimony (metal) in 1 c.cm. of solution. One c.cm. of a 5-per-cent solution of neostibosan contains 21 mgm. of antimony.

Toxicologically, it is very similar to neostibosan, being slightly less toxic than this compound, milligramme for milligramme of antimony when given subcutaneously, and distinctly less toxic when given intravenously—18.5 c.c. (or 370 mgm. of Sb) per kilogramme is the lethal dose for a mouse, against 6 c.cm. of a 5-per-cent neostibosan solution. Its rate of excretion in the urine is rapid, 68.5 per cent being excreted in the first twenty-four hours against 50 per cent in the case of neostibosan, and therefore the effect is even less likely to be cumulative.

*Early trials.*—In 1936, we received some samples of this new antimony compound from the Pharmaceutical Department, Bayer, through their representative, Dr. A. G. Brocke, D.Sc. We tried this preparation in a series of seven cases. The results were not, on the whole, favourable.

Three of the patients developed pneumonia and died. There was at the time an epidemic of influenza in the hospital; many patients developed pneumonia and others besides these three died. The pneumonia developed after the 1st, 3rd and 5th injections, the maximum doses given were 1 c.cm., 6 c.cm. and 6 c.cm., respectively, and in two instances the injections were given intramuscularly. Taking all these facts into consideration, we consider it unlikely that the pneumonia or the deaths were associated in

\*Under favourable conditions we have kept the solution for some days and noticed no increase in toxicity.

any way with the particular treatment. Nevertheless, the coincidence, if such it was, of these three deaths created an unfavourable impression both on our minds and in those of others, and we decided to discontinue using this new compound—for a time, at any rate.

This year, however, we decided to give the compound another trial and we are here reporting our experience in the first 10 cases treated this year.

*The patients.*—These were all Indian males, admitted to the Carmichael Hospital for Tropical Diseases. In every case the diagnosis was made by the finding of the parasite, usually by spleen puncture, but in one case by liver puncture. The cases were not selected, except that those showing special complications were not treated, e.g., one patient with pneumonia and kala-azar and another with pulmonary tuberculosis and kala-azar were excluded; otherwise, consecutive previously-untreated cases admitted to the Indian male wards were treated with this drug.

All the injections were given intramuscularly; the reason for this choice was that the suitability of this drug for intramuscular injections is one of its main recommendations.

The results are shown in tabular form below:

TABLE

*A summary of the findings and the immediate results of treatment by No. 561, a new soluble antimony compound, given intramuscularly, in ten consecutive cases of kala-azar*

Serial number		1	2	3	4	5	6	7	8	9	10
Clinical data.	Initials ..	M. K.	Q. H.	A. K. B.	P. A.	T. N. B.	S. G.	G. Ch. M.	M. B.	S	C. R.
	Age in years ..	20	20	11	11	52	25	14	25	28	25
	Aldehyde reaction ..	+++	+	+++	++	(+)	+++	+	(+)	(+)	+++
	Duration of illness in months.	3	12	12	12	2½	14	9	2½	5	18
Treatment	Number of days ..	19	19	19	15	19	19	10	10	10	10
	Number of injections	10	10	10	8	10	10	10	10	10	10
	Total amount in gramme of Sb.	1.32	1.60	1.04	0.96	1.64	1.60	1.48	1.64	1.74	1.74
Progress	Number of days of fever after treatment commenced.	9	8	16*	A	18*	16*	8	6	9*	7
	Spleen in inches below costal margin.										
	Admission ..	3	6	5	7	3	4	3	2	4½	4½
	Discharge ..	0	1	p	1	1½	2	1½	p	p	p
	Weight in lb.										
	Admission ..	83.50	68.25	49.25	59	93	89.25	56.75	103.25	99.5	78
	Discharge ..	86.5	74.50	50.75	65.25	99.25	89.50	67.25	107.5	102.5	100.25
	White blood count in 1,000's per c.mm.										
	Admission ..	3.65	0.90	1.80	2.80	9.50	7.70	6.9	6.30	4.75	1.250
	Discharge ..	6.00	4.5	9.50	6.50	..	9.40	10.1	..	6.50	5.550

A = afebrile throughout. p = palpable only. \* Low fever throughout.

*Discussion.*—The patients were all of poor physique, probably on account of the disease, but none was desperately ill. The duration of the disease can usually be judged better by the aldehyde test and the size of the spleen than by the history given.

Cases 5 and 8 are obviously early cases. The aldehyde test suggests that case 9 is also an early one, but the size of the spleen is in keeping with the history. Case 1 was almost certainly of longer duration than three months.

### The results of treatment

As we have shown in previous papers (Napier, 1932) there are no absolute criteria of cure in kala-azar; even after a full and effective course of treatment viable parasites may be found in a spleen puncture smear, and yet, subsequently, without further treatment being given they will disappear. It is, therefore, quite impossible to tell immediately, with certainty, whether or not a patient is cured, and the only alternative is to observe the patient for some time. In the past a period of six months has been taken as the test for cure, as it has been found that very rarely, if ever, do patients who have remained free from symptoms for this period subsequently relapse. As this paper is a short preliminary note, none of the cases have been kept under observation for more than a few months.

In assessing the chances of permanent cure by immediate clinical observation, the points

on which we have relied have been (a) the cessation of fever, (b) the reduction in the size of the spleen, and (c) the white blood cell count.

*Fever.*—In no case did high fever continue for more than 9 days; in three, there was a

low irregular fever that lasted for 16 days (in two instances) and 18 days (in one).

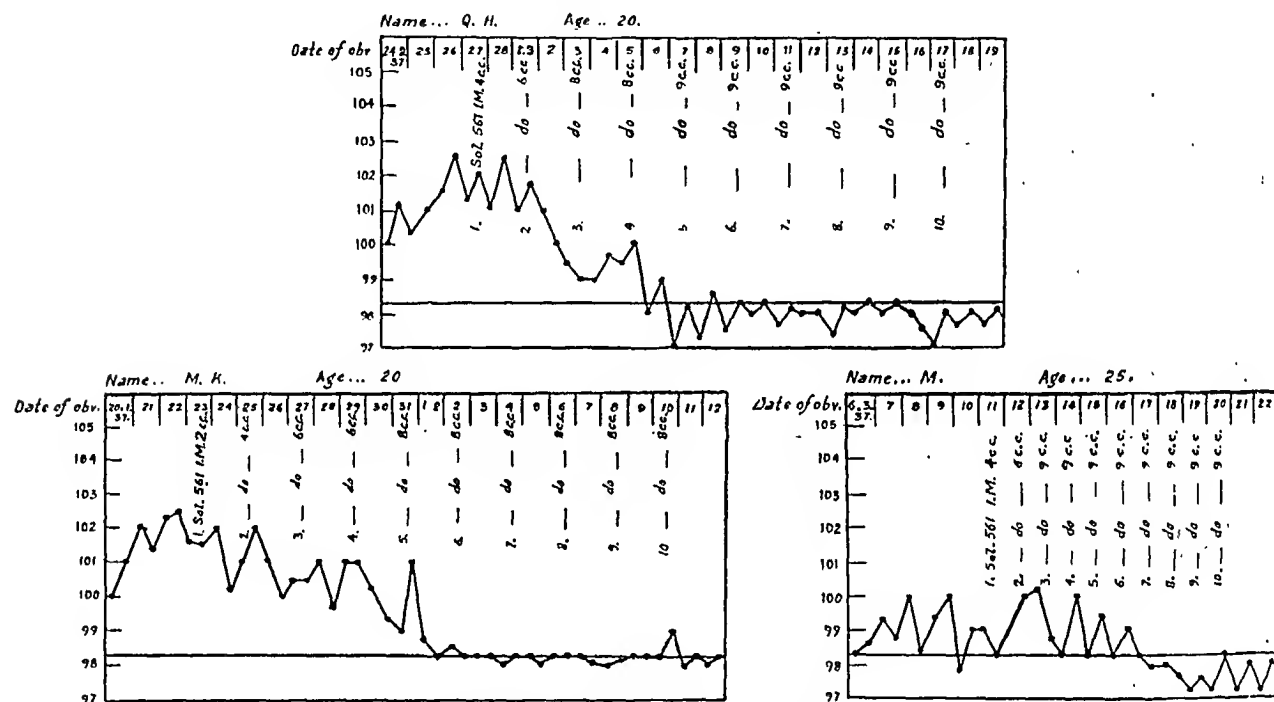
*The spleen.*—In every instance the spleen was markedly reduced and in no case was it more than 2 inches below the costal margin at the time of discharge.

*Weight.*—It is quite common for the weight to become reduced during the course of treatment; this may be due to the disappearance of some slight œdema or to the reduction in the weight of the spleen. The reduction in weight is only temporary and a fairly rapid increase follows.

In each of these cases the weight increased during the patient's stay in hospital and subsequent to the commencement of treatment: the average increase was 5 lb.

regarding the comparative efficacy of this compound on so small a series of cases. A paper on the results of treatment in a series of 254 cases of kala-azar treated by neostibosan was published some years ago (Napier, 1932a). In these, the average duration of fever was 8 to 9 days, the average increase in weight 5 to 6 lb., and the average final white cell count 7,000 to 8,000; the spleen was palpable in 64 per cent of cases, and was over an inch below the costal margin in 12 per cent. The results in most of the cases of the present series compare quite well with these, but the number is too small to allow one to attach any importance to averages.

The only conclusion at which one can arrive, on these preliminary trials, is that this drug is probably in the same class as neostibosan



Temperature charts of three cases in this series.

*The leucocyte count.*—This is usually below 4,000 per c.mm. and nearly always below 6,000. Actually, in four cases in this particular series it was above 6,000. In two of the latter it was not repeated at the time of discharge, but in the other eight cases there was a decided increase. In the case in which the initial count was less than 1,000 the final count was 4,500, but in the other seven the final count was over 6,000.

*Conclusion.*—The clinical evidence shows that there was definite improvement and suggests that a complete cure was probably effected in every case.

Time alone will provide final proof of this but this is essentially a preliminary communication in which no special claims regarding the comparative efficacy of the drug are made.

*Comparative efficacy of this drug.*—It is quite impossible to arrive at any conclusion

in regard to its efficacy in the treatment of kala-azar.

*Dosage.*—Both the individual and total dosage have been arbitrarily chosen. The largest individual dose was only a small fraction of the largest dose tolerated by animals, so that it could probably be increased, but, on analogy with neostibosan, it seems probable that about 10 c.cm. will be the largest effective dose. Similarly, the total dosage could probably be reduced.

Neostibosan contains 42 per cent antimony: therefore the minimum total dose in this series, 0.96 gramme Sb is the amount that would be contained in 2.3 grammes of neostibosan, and the maximum, 1.74 grammes Sb that in 4.1 grammes of neostibosan, which is more than the total dose usually given in a straightforward case.

(Continued at foot of opposite page)

## INSULIN ANAPHYLAXIS

By J. P. BOSE, M.B., F.C.S. (Lond.)

*Diabetes Research Department, School of Tropical Medicine, Calcutta*

**Introduction.**—Localized and sometimes generalized anaphylactic reactions, due to hypodermic injections of insulin, have been reported in the literature from time to time. In most of these cases a positive skin reaction has been found to occur while negative reactions were obtained in control cases. It is thought that the patients were more or less sensitive to the serum of the particular animal from which insulin was derived. Insulin is a complex protein derivative, probably of the nature of a proteose and, as such, is likely to cause urticarial forms of allergy specially in diabetic

*(Continued from previous page)*

**Local effect.**—Only one patient complained of any pain after the injection and in his case the pain lasted only an hour or so. No abscess formation or even local induration was noted in any case.

*Summary and conclusion*

A series of ten consecutive cases of kala-azar treated by intramuscular injections of a new antimony compound, No. 561, is reported.

The immediate results were very satisfactory and there is every reason to hope that in all ten cases a cure was effected. Ten injections were given in nine cases and 8 in one case.

The injections were given on alternate days in six cases and daily in four. No untoward symptoms, either general or local, were noted in any case.

In that No. 561 is a stable compound that remains unchanged even in solution, that it can be given intramuscularly without causing any local damage to the tissues, and that, in its efficacy in the treatment of kala-azar, preliminary trials suggest that it is in the same class as neostibosan, its introduction constitutes a distinct advance in the treatment of this disease.

This enquiry was facilitated by the establishment of a kala-azar enquiry at the School which is financed by the Indian Research Fund Association.

Our thanks are due to Professor Hans Schmidt of Elberfeld, who prepared the compound, and to Dr. A. G. Brocke and Bayer, I. G. Farbenindustrie A. G., Leverkusen, who supplied it to us for trial.

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patients who, according to many workers, including Kern (1934), have a peculiar predisposition to such reactions. The work of Kern and Lukens further demonstrates the frequency of diabetes in allergic families, and this in itself would be expected to predispose the patient to insulin allergy (Joslin, 1937). Allan and Scherer (1932) have demonstrated that 10 per cent of the diabetics treated at the Mayo Clinic suffer from insulin allergy. It appears that improvement in the mode of preparation of insulin has to some extent helped to lessen the allergic manifestations but in the more hypersensitive diabetic patients, even crystalline insulin has been found to bring on undesirable and sometimes well-marked anaphylactic reactions.

It is a significant fact, however, that diabetic patients who are extremely sensitive to one brand or preparation of insulin often become much less so when the brand is changed; in some cases these reactions disappear altogether by only changing the particular brand—such as changing from the American preparations (made usually from the pig pancreas) to British insulin (made from the ox) and *vice versa*. Such a simple measure in such apparently grave crisis must be considered as a circumstance of great fortune to most diabetic patients, as otherwise one would either have to give up insulin treatment or do it at great risk and discomfort to the patient. Undoubtedly grave forms of insulin allergy, severe enough to embarrass insulin therapy, are rare. So far only 10 such cases have been described in the literature (Bayer, 1934).

The present paper deals with a case which appears to be different from all others that have come under the author's observation, in that the reactions were so stubborn and persistent that it has not been found possible to carry on insulin treatment on the patient, even in emergencies, up to the present time. This naturally has been a great handicap, especially having regard to the fact that the diabetic condition of the patient is fairly severe and of long standing. Another fact of interest in the present case is that the hypersensitiveness to insulin appears to have developed suddenly—courses of insulin given previously to the patient having produced no undesirable effects.

**Symptoms of insulin anaphylaxis.**—The symptoms of insulin anaphylaxis, usually encountered, begin as a rule within a short time of the injection, sometimes within five minutes. A small or fair-sized weal usually appears at the site of the injection followed almost immediately by urticarial rashes throughout the body. This causes an uncontrollable generalized itching which lasts for an hour or more. Grave constitutional symptoms, such as nausea, vomiting, cardiac distress, as encountered in the case under discussion, have been fortunately rare among other cases under the author's observation.



**Desensitization.**—The usual treatment advocated for desensitization consists of :—

- (1) Intradermal injections of minute doses of insulin, beginning with 0.001 units, at frequent intervals, gradually increasing the dose as advocated by Bayer (1934). This, however, appears to be a somewhat long process of desensitization.
- (2) Repeated injections of small doses of histamine phosphate [as advocated by Collens, Lerner and Fialka (1934)]. This appears to be a quicker method of desensitization.

**Case G. S., H. M.,** aged 59 years, a medical practitioner of repute in Calcutta. Sugar detected in urine in 1926 (11 years ago) shortly after a severe shock caused by the death of the patient's wife. The patient had also a lot of worries about a year or more before the glycosuria was detected.

In October 1929 the patient had a severe attack of influenza with broncho-pneumonia and a throat culture showed an almost pure growth of streptococci. An injection of strepto-serum (polyvalent) was given but did not produce any appreciable result. An auto-vaccine from the throat was then made; the injection of the first small dose of vaccine, however, produced, quite unexpectedly, symptoms of severe anaphylaxis—urticaria, oedema of the lips, cardiac distress, nausea, asthma-like attacks and anuria. This condition took about two or three days to subside completely. The patient, however, got better gradually and a change of climate brought him back to health though the glycosuria continued in spite of fairly strict dieting.

In July 1931, a course of insulin injections was given for about 18 days continually. The fasting blood-sugar level was 0.266 per cent at the beginning of the treatment. No appreciable reduction in the blood sugar was effected though there was never any sign of insulin intolerance or anaphylaxis throughout the course.

About a year after, the patient's condition grew somewhat worse and it was thought that insulin should be given another trial. On the first day a small dose of 5 units of insulin (Mulford) was injected in the left arm. Within half an hour of the injection a small raised weal appeared at the site of the injection followed by urticarial rashes all over the body. The face was flushed, slight catarrh of the nasal and respiratory passages appeared, followed by wheezing rhonchi and typical asthma-like symptoms. There was great prostration. These symptoms, however, began to abate within an hour or so and completely disappeared within four hours. Next day even a smaller dose of 2 units produced exactly the same symptoms. Insulin was then stopped temporarily, but a second attempt to start it again with another brand of insulin (Insulin—Schering) produced the same result. One very peculiar feature noticed was that whether the injection was given in the right or the left arm the first urticarial weal always appeared at the site where the injection was first given (*i.e.*, the left arm).

It was now thought that the patient should be desensitized and an insulin tolerance should gradually be established to guard against future emergencies. To attain this, attempts were made with minute but repeated doses of insulin (B. W. crystalline). This also proved futile. The first two minute doses were borne fairly well by the patient but the third dose produced symptoms severe enough to make it necessary to give up the injections and treat the condition. Further attempts have not been made since though the author is contemplating making another attempt to desensitize the patient with minute doses of zinc protamine insulin.

It should be mentioned here that desensitization by histamine phosphate as advocated by

(Continued at foot of next column)

## LETZKO'S OPERATION AS A TREATMENT FOR THE 'FAILED FORCEPS' CASE

By J. F. SHEPHERD, M.B. (Aberdeen)  
MAJOR, I.M.S.

*District Medical Officer, Coimbatore*

CLASSICAL Cæsarean section is an unsatisfactory operation. The uterus is cut in an active part, leaving a weak scar. Hæmorrhage

(Continued from previous column)

Collens and others (1934) was not tried in this case, because, owing to the presence of albuminuria with high blood pressure, it was thought inadvisable to give repeated injections of histamine to the patient.

It will thus be evident that the hypersensitiveness to insulin injections in the patient developed suddenly. This appears to support the views of most authors who have suggested that insulin hypersensitiveness should be classed as an acquired status, similar to drug and serum allergy, which comes on gradually and increasingly, more particularly after irregular use of insulin.

It should also be mentioned that irregular but occasional courses of insulin have been given in many non-diabetic cases, such as tuberculosis, sprue, marasmic children, etc., but the author has not met with a single case of insulin allergy in them.

**Summary and conclusions.**—A case of insulin anaphylaxis in a fairly severe case of diabetes, having several features of special interest, has been described. The reactions to insulin injections were so severe and persistent that it has not been found possible to carry on insulin treatment on the patient even in emergencies. Neither the change of the brand of insulin nor desensitization experiments with minute and repeated doses of insulin helped to stop or reduce the sensitiveness.

A feature of special interest in the case is that the hypersensitiveness to insulin appears to have developed suddenly—courses of insulin given previously having produced no undesirable effects. Another feature of interest noted in the present case is that, as soon as the insulin injection was given, an urticarial weal always appeared almost immediately in the left arm (*i.e.*, at the site where the first insulin injection was given) irrespective of the site of the subsequent injections.

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is brisk and some degree of contamination of the abdominal viscera by irritating fluids is almost certain, however carefully packing is carried out. The most serious objection, however, to the classical operation is that it is contra-indicated in infected cases, as it is followed by peritonitis and death in about 25 per cent of cases. Consequently, in a 'failed forceps case badly handled outside' the child, if still alive, has almost invariably to be sacrificed and craniotomy done, even though the mother is an elderly primipara and very anxious to have a baby (Cæsarean hysterectomy is a rather desperate alternative to craniotomy).

Lower-uterine-segment Cæsarean section does away with most of these disadvantages. In this operation the peritoneal cavity is opened by a mid-line sub-umbilical incision: the loose peritoneum of the utero-vesical pouch lifted up and divided transversely: and the peritoneum and emptied bladder stripped off the anterior surface of the lower uterine segment. A curved transverse incision is made through the exposed lower segment through which delivery is completed and the incision closed. The divided peritoneum of the utero-vesical pouch is then united and this brings the bladder over the suture line in the lower uterine segment. This part of the uterus is comparatively inactive and does not contract and retract like the upper segment. The suture line has, therefore, a fairly good chance of remaining taut during healing and preventing leakage of septic uterine contents. Further, as the incision is protected by the bladder, at worst a localized extraperitoneal abscess and not general peritonitis might be expected to follow leakage. This, however, does not always happen and the last operation of this kind done by me, died of general peritonitis a week later. On post-mortem examination it was found that part of the incised tissues of the lower uterine segment had become gangrenous and gaped, so that infected uterine discharges had tracked upwards, burst through the sutured peritoneum of the utero-vesical pouch, and poured into the general peritoneal cavity with fatal results. An extraperitoneal drain to the suture line might have prevented this.

#### *Letzko's operation*

Letzko's operation is designed to prevent such untoward happenings. The operative risk is little greater than that of craniotomy: if the woman dies the usual cause of death is puerperal sepsis which is not more severe after Letzko's Cæsarean section than after craniotomy. In any case the child is given a chance of its life.

The operation has been so satisfactory in my hands that I venture to publish this article, based on only twelve cases, with the object of bringing before the profession an excellent, but apparently neglected, surgical procedure.

#### *The technique*

The technique of the operation is as follows:—

(The patient is catheterized on the table.)

1. A mid-line sub-umbilical incision is made from just below the umbilicus to just above the pubis down to the deep fascia. The skin gapes widely owing to the intra-abdominal pressure and on palpating in the depths of the wound it will be found that the recti are not parallel but have separated from each other so that at the umbilicus they lie two to three inches apart. Superiorly their edges are difficult to define but below a part can always be found where the medial edge of each rectus muscle can be identified.

2. At the point identified, a nick is made into the rectus sheath, the muscle seen, and one blade of a pair of blunt-pointed scissors inserted into the opened sheath. It is then very easy to slit up the inner edge of the rectus sheath through the entire extent of the wound. Superiorly the skin will have to be undermined a little to facilitate this. When the dissection has been completed on both sides, two flaps consisting of the aponeurosis of the obliqui and transversales muscles will be freed, so that when their raw edges are sewn together at the end of the operation, divarication of the recti will automatically be corrected, and the risks of an incisional hernia abolished.

The entire dissection, if conducted at this stage while the abdominal wall is still tensed by the full-time uterus, is very easy and takes but a few moments.

3. The surgeon standing on the patient's right side strips the peritoneum from the posterior aspect of both recti, going down into the pubic region so as to clear the antero-superior aspect of the bladder as far as possible. The peritoneum is loosely attached all round except at the fundus of the bladder, and is very easily mobilized except at this part. There is no bleeding.

4. Mobilization of the peritoneum is continued on the right side until a little beyond the lateral edge of the right rectus, when stripping is continued in an antero-inferior direction to clear the floor and brim of the true pelvis, about an inch of the external iliac vein being exposed at this stage. Division of the obliterated hypogastric artery found running between the bladder and the peritoneum of the floor of the pelvis is sometimes necessary before the peritoneum can be stripped up sufficiently in the pelvic floor.

5. If the mobilized peritoneum is now retracted upwards, a triangular space will be exposed, the apex downwards, the base formed by the freed folded edge of the peritoneum, and the sides by the wall of the pelvis, laterally, and the bladder medially. In this triangle lies the lateral ligament of the bladder consisting

of a thin sheet of interlacing muscular fibres. The lower uterine segment lies immediately posterior. The bladder retracted to the left and the peritoneum upwards, the surgeon carefully identifies and holds up a strand of the lateral ligament for the assistant to cut with the scissors. The surgeon inserts his fingers through the opening thus made and pulls the ligament forward away from the uterine vessels so that the assistant may cut a few more strands in safety.

6. Between the lower uterine segment and the bladder is a layer of very loose areolar tissue. The fingers of the surgeon are insinuated into this layer separating the bladder and pulling it anteriorly. Burrowing to the left is continued until the lower segment is cleared from one set of uterine vessels to the other for a depth of about 2 inches.

The surgeon now examines the remaining attachments of the bladder, snips a few fibres of the lateral ligament and strips the peritoneum a little further where necessary. When this has been done, the bladder can be dislocated to the left so as to expose about a third of the anterior aspect of the lower uterine segment. The left two-thirds of the segment, though overhung by the bladder, are quite accessible when the bladder is retracted anteriorly.

Exceptionally it has been found possible to mobilize the bladder and retract it so far to the left that the entire uterine segment has been exposed. A third to a half, however, is the usual exposure.

7. A few vessels may be seen crossing the visualized line of incision in the lower uterine segment and they are doubly under-run and tied.

8. A curved semilunar incision, convex inferiorly, is now made in the lower uterine segment by successive sweeps of the knife, beginning high on the left side and ending at the mid-line, and then repeating the manoeuvre on the other side keeping the back of the knife towards the bladder. There is very little bleeding, and, if the membranes have not ruptured, it is very easy to divide the wall of the uterus cleanly through the whole length of the incision. The membranes bulge into the wound and there is no flooding of the wound with liquor amnii. A few snips with the curved Mayo scissors complete the section.

The ends of the incision are about 4 inches apart and as the opening is curved, ample room for delivery is provided.

9. The hand is now inserted into the uterus and if the woman is in labour it is quite easy to coax the presenting part over the lower lip of the wound in the uterine segment and complete delivery. If the woman is not in labour, pressure on the fundus is made and if necessary the ordinary midwifery forceps applied, when complete control is given to the surgeon who can extract the child with ease and safety. If the presenting part is a breech or a shoulder

the surgeon inserts his hand and delivers by traction on the child's feet.

10. Delivery completed, the child is attended to and the cord divided as usual, and 1 c.cm. pituitrin injected into the uterus. The placenta and membranes are dealt with; in infected cases a roll of gauze soaked in glycerine is put in the uterus and the lower end thrust into the vagina, for removal immediately after the operation is finished.

11. The wound in the lower segment is now closed by two layers of sutures, the first picking up mucosa and a little muscle, the second taking a firm grip of the muscle wall.

12. A separate stab just to the right of the right rectus origin is made and a drain inserted down to the suture line.

13. The abdomen is closed in two layers of sutures. The first bring together the anterior sheaths of the recti, prepared as described before, the second being the skin suture. It is advisable in infected cases to drain the superficial wound by a strip of rubber removed in 48 hours.

The original Letzko's operation differs slightly from the one described and a few modifications have been introduced to make the procedure simpler, safer and more effective.

Letzko apparently advises distension of the bladder with 200 c.cm. boric solution so that damage to it may at once become evident during the operation and the damage repaired. He opens the uterus by a vertical incision. This incision to be of adequate size must extend almost the entire length of the lower segment and end practically at the external os. A deep dissection must, therefore, be done inferiorly near the base of the bladder, where access is poor, bleeding hard to control and where the bladder is more firmly adherent than superiorly. It is in making this deep dissection that the bladder and even the ureter may be in danger. The method described gets over this difficulty and in addition the ample transverse incision has no part of its length in the depths of the pelvis but lies in an accessible part of the uterine segment.

The peritoneum is mobilized on the right so as to avoid all risk of trauma to the left external iliac vein in which post-partum thrombosis is more common than in the right vein.

### Results

I have now performed Letzko's operation twelve times. The maternal mortality has been nil, the infant mortality, two weakly twins who died three and seven days after birth. In four of the cases the women were elderly primigravidae each anxious to have a live child. Eight of the women had been in labour 12 to 48 hours: these had had forceps applied in their own houses by private practitioners: they all ran a febrile course for about two weeks.

One woman—the first case done—had been in labour for two days and had had forceps applied by three doctors before coming to hospital and was obviously septic. After operation she had a continuous temperature 100 to 102 for five weeks and dirty purulent material drained both through the vagina and through the suprapubic tube. Cæsarean hysterectomy would have given her a live child but would have been too severe for a patient already shocked and exhausted. Letzko's operation being extraperitoneal and practically bloodless caused very little disturbance to the patient: there was no shock. She is now, a year later, in excellent health.

One case, a central placenta prævia, had had a very severe hæmorrhage and was almost *in extremis* when brought to the theatre. It is considered that an intraperitoneal operation (classical Cæsarean section or the usual lower segment operation) would have killed her. As it was Letzko's extraperitoneal section under a local anæsthetic did not appear to affect her at all and, after the intravenous glucose salines given during the operation, she was able to leave the theatre in good condition and to make an uneventful recovery.

In the infected cases there was profuse purulent discharge from the drainage tube for five to ten days. It is not possible during the operation to prevent the dirty uterine contents from coming into contact with and infecting the large cellular spaces opened up by the dissection. This infection, however, does not seem to be very severe and in all my eight cases has cleared up satisfactorily.

#### Commentary

The operation is not an easy one technically. Exposure of the lower uterine segment is difficult and access more so. With care, enough room can be obtained to complete delivery but sometimes with very little to spare. Occasionally a vein pierces the lateral ligament of the bladder and is ruptured during the dissection when bleeding is not easy to control. With reasonable care there would appear to be little danger of injury to the bladder and ureter, but it is otherwise with the peritoneum. The doubled lower free edge of this membrane closely simulates a strand of the lateral ligament of the bladder and may be cut in mistake—a mistake however easily recognized. The rent is at once stitched up. In attempting too free exposure, it is easy to pull upwards on the peritoneum and tear it where it becomes firmly attached to the upper uterine segment. When this happens a continuous suture should be inserted at once before the uterus is opened, so that infected uterine fluids may not find a way into the general peritoneal cavity.

Future experience may show that adequate exposure of the lower uterine segment by

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## TREATMENT OF PLAGUE CASES WITH CONVALESCENT HUMAN SERUM

By J. N. NORMAN-WALKER, C.I.E., M.R.C.P.,  
D.T.M. & H.

COLONEL, I.M.S. (Retired)

Director, Medical and Public Health Department,  
Hyderabad Dominions

THE treatment of plague has remained a difficult problem in spite of continuous research all over the world. There is no specific for plague. So far dependence has been placed on good nursing, rest and stimulants.

Bacteriophage and protein therapy have been tried but with no very encouraging results.

(Continued from previous column)

Letzko's method is impossible in certain cases. The correct procedure in such circumstances would appear to be division of the peritoneum from the fundus of the bladder by the scissors as in Michon's operation, and careful suture of the anterior flap to the peritoneum of the upper uterine segment and broad ligament. The bladder could then be displaced forward with excellent exposure of the lower segment for subsequent incision and delivery. The peritoneal cavity would be opened and closed at once and protected from the uterine discharges so that the operation and drainage would still be practically extraperitoneal.

#### Summary

Lower uterine segment Cæsarean section is much more free from danger of post-operative peritonitis than the classical operation. Exposure is obtained by opening the peritoneal cavity through a mid-line sub-umbilical incision dividing the peritoneum of the utero-vesical pouch and stripping the bladder off the anterior aspect of the lower uterine segment through which Cæsarean section is done.

Letzko's extraperitoneal operation is a great advance on this. A sub-umbilical mid-line incision is made down to the peritoneum which is stripped up to expose the right side of the bladder and the wall of the pelvis with the right lateral ligament of the bladder running between. This ligament is cut and the bladder can then be pushed over to the left, giving access to the lower uterine segment. Cæsarean section is done through the latter, the wounds closed, and extraperitoneal drain inserted through a separate stab down to the suture line in the uterus.

The peritoneum is not divided at any stage in this operation and the risk of peritonitis is therefore remote.

I wish to acknowledge my debt to Lieut.-Colonel C. M. Plumtre, professor of midwifery, Madras, who taught me all I know about Letzko's operation and whose kindly help and encouragement during the preparation of this paper have been invaluable.

Many kinds of anti-plague sera have been prepared and used from time to time, but the results have been disappointing. Between 1897 and 1912 six different sera, Yersin's, Lustig's, Terni's, Haffkine's, Brazil's and Rowland's, were tried and all failed to show any appreciable reduction in the case mortality. The case mortality among the untreated cases was between 70 and 85 per cent and among the treated cases between 65 and 82.

The technical difficulties and expense of preparation of Naidu and Mackie's anti-plague sera could only be justified by a greater success than has been reported so far.

Naidu and Mackie working at the Haffkine Institute at Bombay prepared a serum from

Disappointed with the results obtained by exhibiting every known form of treatment, I determined to try convalescent human serum in plague cases. The results obtained in the few cases available are encouraging.

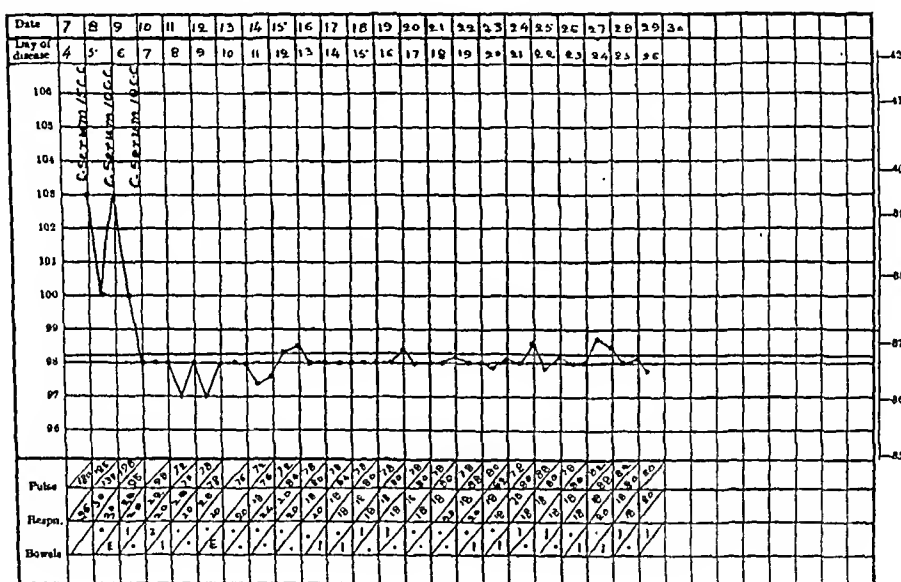
### Technique

Serum is obtained from cases of plague during convalescence after the temperature has been normal for ten to fifteen days, the day selected depending on the condition of the donor. The blood is drawn from a vein and the patient from whom it has been drawn is examined to exclude the presence of syphilis, tuberculosis and malaria. Those with suspicious signs of

### TEMPERATURE CHART

#### Isolation Hospital Temperature Chart

Bed No..... Ward.... Register No..... Name Yenkamah. Disease Plague.



sheep and tested it in the 1931 epidemic in Hyderabad-Deccan. The mortality among the serum-treated cases was 35 per cent and that among the controls 70 per cent. Similar improvement was not obtained during a further trial at Poona. In this case the serum was prepared from buffaloes.

Later another serum was prepared by the Haffkine Institute from horses and was tested in Hyderabad-Deccan during the 1935 epidemic. The case mortality was 29 per cent among those treated with serum against 58 per cent among the controls. The number of cases treated was very small.

Human convalescent serum has been extensively used with encouraging results in the prophylaxis against measles, but no records are available regarding its use in the treatment of the disease.

syphilis and all with blood Kahn positive are excluded. If the conditions are satisfactory, the serum is made use of. As a rule about 40 c.cm. of blood are drawn from a vein and transferred to a sterilized test tube. These tubes are kept in a refrigerator for about 12 hours. The serum is then separated and injected intramuscularly into the gluteal region of the patients. At every stage all possible care is taken to observe thorough asepsis. It may be noted that neither the withdrawal of this amount of blood from the donor nor the injection of the serum into the recipient was followed by any ill effects whatsoever.

### Dosage

At first 10 c.cm. were given but later this was increased. In 13 cases no more than 15 c.cm. were available, but 20 c.cm. was the dose aimed

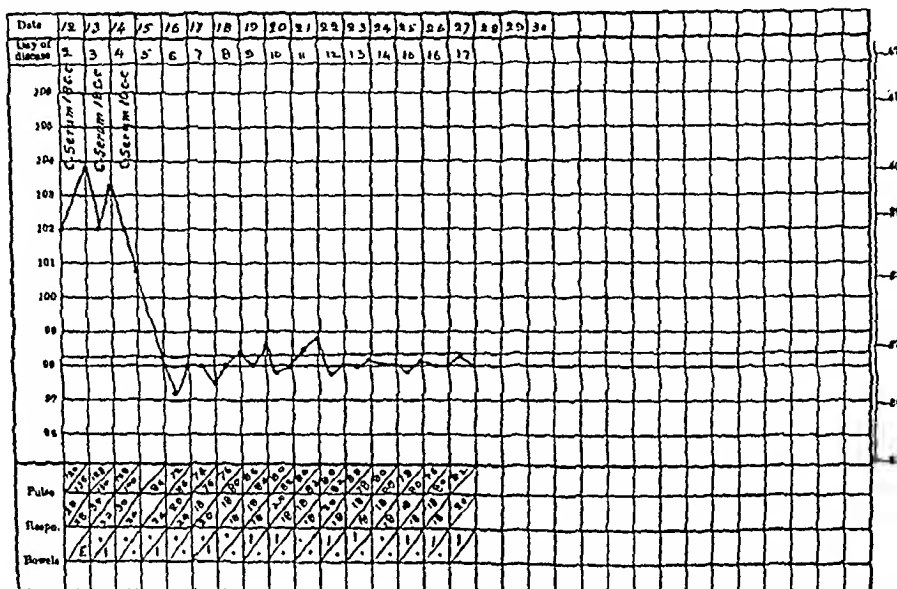
at. In most cases (45) three doses on successive days were all that were required to bring the temperature to normal. Only in three cases were more than three doses required. Side by side with these serum-treated cases the same number of control cases of approximately equal

It must be noted that there was no selection of cases except that cases admitted in a moribund condition were excluded from the observations. Eighteen cases were admitted in a moribund condition and all died within eighteen hours.

### TEMPERATURE CHART

#### Isolation Hospital Temperature Chart

Bed No..... Ward.... Register No..... Name Ramabai. Disease Plague.





premature contraction; 2 showed pure or impure auricular flutter. In the remaining 9 cases, a normal electrocardiogram was obtained in 8 cases in between the periods of auricular fibrillation, and 1 showed auricular premature contraction without any other abnormality in the electrocardiogram.

### *Ætiology*

(1) *Rheumatic infection* was manifested in 19 cases (48 per cent), of which 5 were pure mitral stenosis, 13 were mitral stenosis and regurgitation and one mitral stenosis and aortic regurgitation.

(2) *Syphilis* was manifested in 7 cases (17 per cent). There were 2 cases of aortic regurgitation and 5 cases of myocarditis with strongly positive Wassermann reaction.

(3) *Myocarditis*.—Ten cases (25 per cent) belong to this group. Of these 2 were in old people with senile myocarditis and auricular fibrillation. In the remaining 8 cases no definite cause could be assigned for the myocarditis. Wassermann reaction was negative in all these cases.

(4) *Thyrototoxicosis*.—There were 2 cases in this series.

(5) *Beriberi*.—Only 1 case of beriberi showed auricular fibrillation.

### *Clinical course of auricular fibrillation*

*Case 1*.—Hindu male, 35 years, admitted on 12th December, 1930, for double mitral and auricular fibrillation with extra-systoles. Patient was under observation for two years. He was free from auricular fibrillation only for a week while in hospital.

*Case 2*.—Hindu male, 55 years, admitted on 13th December, 1930, with signs of congestive heart failure, double mitral and auricular fibrillation. The patient was in the hospital for five weeks and three electrocardiograms were taken during his stay in the hospital. All the three showed evidences of auricular fibrillation with left ventricle premature contraction (RVPC new terminology). This patient most probably is a case of chronic myocarditis with persistent auricular fibrillation.

*Case 3*.—Hindu male, 25 years, admitted on 12th December, 1930, for mitral stenosis and aortic regurgitation. Patient developed auricular fibrillation and extra-systoles while in the hospital. Fibrillation lasted for two days.

*Case 4*.—Hindu male, 60 years, admitted on 23rd March, 1930, with signs of left ventricular failure and auricular fibrillation. Fibrillation persisted for more than a year. This is a case of atherosclerosis and myocarditis with persistent auricular fibrillation.

*Case 5*.—Hindu male, 44 years, admitted on 22nd April, 1931, with signs of congestive heart failure and auricular fibrillation—a case of myocarditis of unknown origin with persistent auricular fibrillation. In this case digitalis and quinidine could not control the fibrillation.

*Case 6*.—Mohammedan male, 44 years, admitted on 4th May, 1931, with double mitral lesion and signs of congestive heart failure—a case of rheumatic infection and mitral endocarditis with auricular flutter and fibrillation. He had three paroxysms of auricular flutter. This case is interesting as he passed through auricular flutter into fibrillation and thence into regular sinus rhythm during his stay in hospital.

*Case 7*.—Hindu male, 19 years, admitted first on 7th June, 1930, for congestive heart failure and auricular fibrillation. Between 7th June and the date of his

death on 16th July, 1934, he was admitted eight times for congestive heart failure, but it was only on three occasions that he had auricular fibrillation as well. Between the paroxysms of auricular fibrillation he had normal sinus rhythm. Post-mortem examination showed a markedly enlarged globular heart with chronic sclerosing endocarditis of mitral valve.

*Case 8*.—Indian Christian male, 25 years, admitted on 19th September, 1936, for exophthalmic goitre. Electrocardiogram taken on 21st September showed sinus tachycardia and left ventricular preponderance. The patient developed an ischio-rectal abscess on 21st September, and with it developed auricular fibrillation. The abscess burst and the auricular fibrillation subsided. This is a case of exophthalmic goitre developing paroxysm of auricular fibrillation with infection.

*Case 9*.—Hindu male, 50 years, a case of atherosclerosis, essential hypertension, aortic regurgitation and auricular fibrillation. His fibrillation is persistent for the past five months.

*Case 10*.—Hindu male, 55 years, admitted on 20th March, 1937, for congestive heart failure and auricular fibrillation with myocarditis of unknown origin. Fibrillation is persistent for the past six months.

The details of 10 cases are given describing the onset and course of auricular fibrillation. In a few it occurred in short paroxysms, while in the majority it was persistent. In one case auricular fibrillation followed an attack of auricular flutter. All cardiologists agree that auricular fibrillation when occurring in paroxysms usually lasts only a few hours or a few days and never more than ten days. In case 8 the paroxysm lasted only for 36 hours. East and Bain are of opinion that, if fibrillation persists for more than seven days, the condition is likely to be permanent. According to Lewis (1933) auricular fibrillation once established persists throughout life unless stopped by treatment.

Auricular fibrillation can coexist with ventricular extra-systoles. There were five cases in this series. Auricular extra-systoles might precede or follow an attack of auricular fibrillation but they do not occur together. In one of the cases, the patient developed auricular extra-systoles when fibrillation stopped.

### *Diagnosis of auricular fibrillation*

1. *Clinical diagnosis*.—The condition can always be diagnosed at the bedside both by positive and negative signs.

#### *(a) Positive signs*

(1) Irregularly irregular pulse both in force and time.

(2) Irregularity is increased by exertion. This method should not be used if the condition of the patient is bad.

(3) On auscultation one can hear small beats followed by a long or short beat or a series of long beats, followed by short or long beats. This condition distinguishes it from extra-systoles in which the compensatory pause always follows the premature contraction. The heart rate may be rapid (180 per minute) or slow (60 per minute), the usual rate being 100 to 140 per minute. All the contractions of the heart are

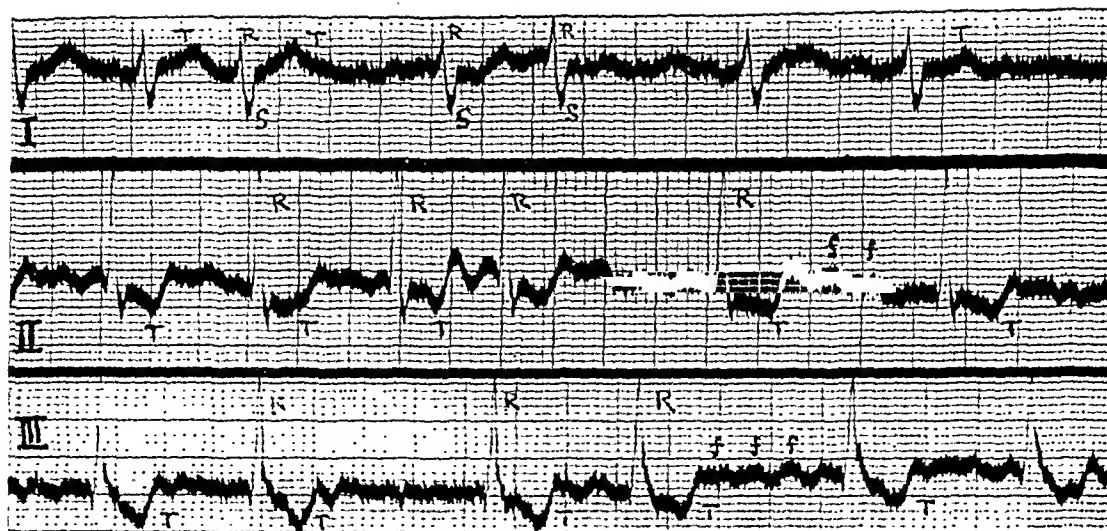


Fig. 1.

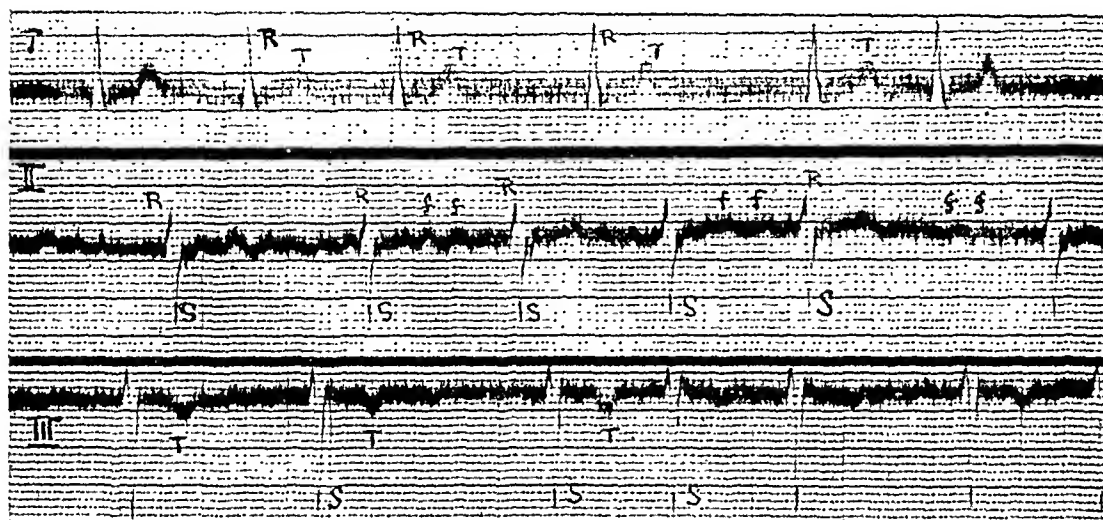


Fig. 2.

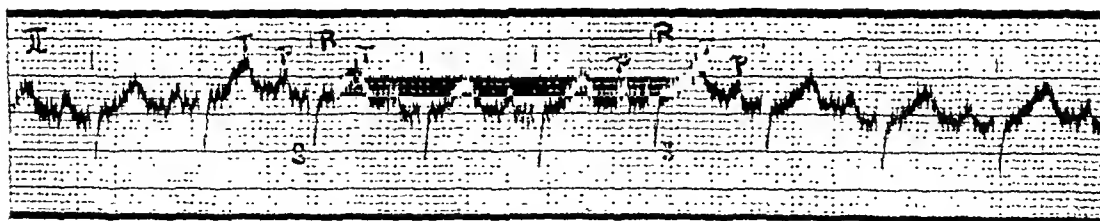


Fig. 3.

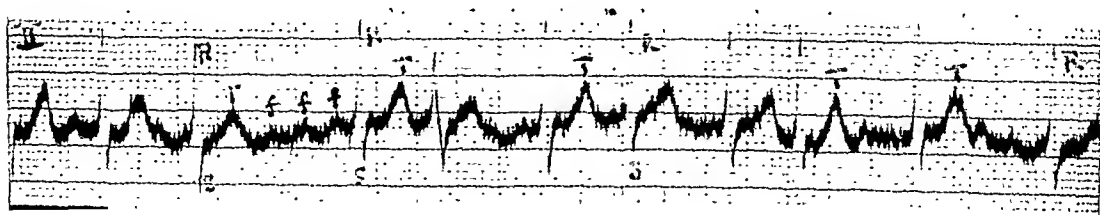


Fig. 4.

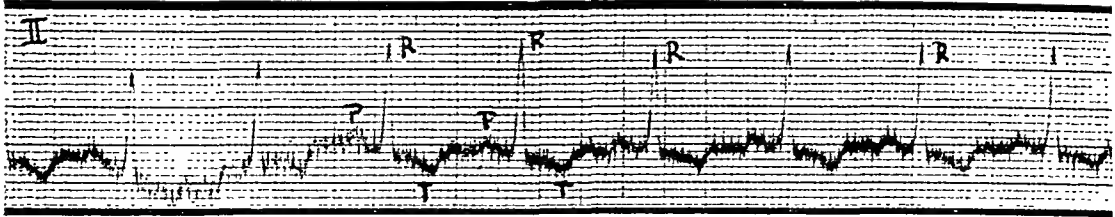


Fig. 5.

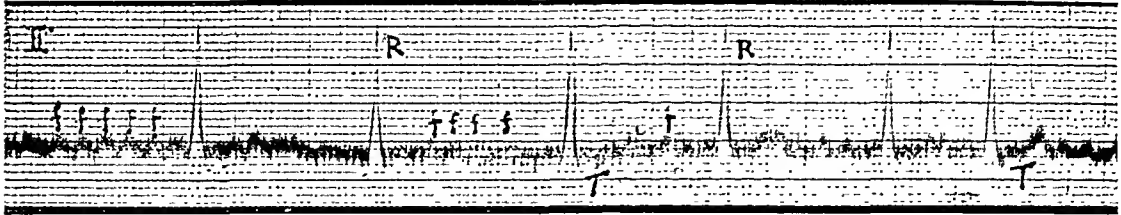


Fig. 6.

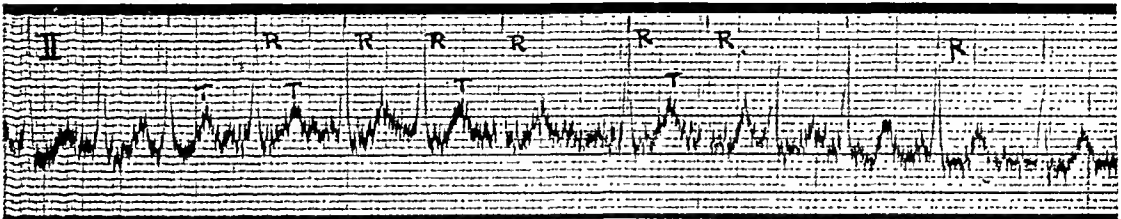


Fig. 7.

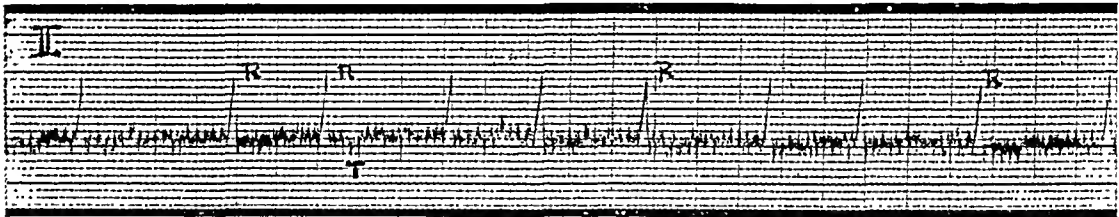


Fig. 8.

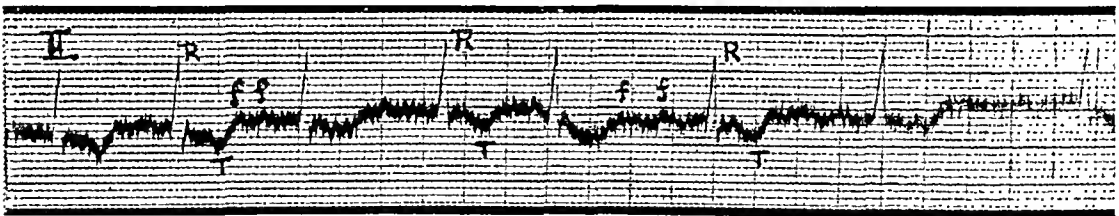


Fig. 9.

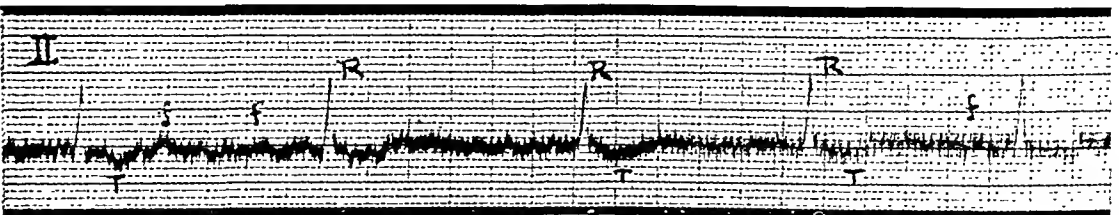


Fig. 10.

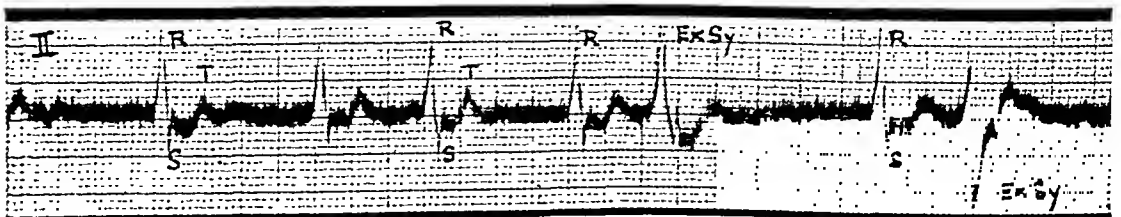


Fig. 11.

not transmitted to the wrist, so the pulse rate is always slower than the heart rate.

### (b) Negative signs

(1) Absence of (a) wave in the jugular tracing. An experienced clinician can always spot this condition at the bedside. Jugular pulsation cannot be made out if the veins are over-distended.

(2) Disappearance of presystolic murmur in cases of mitral stenosis. When auricular fibrillation sets in, presystolic murmur in case of mitral stenosis disappears. So if a patient has only presystolic murmur, no murmur will be heard when fibrillation sets in, but if a diastolic murmur was present it will persist.

(3) *Disappearance of gallop rhythm.*—Auricular contraction is necessary for the production of gallop rhythm (Bramwell, 1935).

When auricular fibrillation sets in there is no co-ordinated contraction of the auricles and gallop rhythm disappears.

### Electrocardiographic diagnosis

(1) There is irregularity both in the spacing and the amplitude of the R wave.

(2) Disappearance of P wave.

(3) The presence of fibrillary waves.

These findings are common to all the groups.

*Figure 1* (leads I, II and III).—Patient with mitral stenosis and auricular fibrillation, showing right ventricular preponderance with well-marked negative T wave in lead III. Fibrillary waves are prominent.

*Figure 2* (leads I, II and III).—Old man of 60 years with senile myocarditis (case 4) showing left ventricular preponderance with negative T wave in lead III.

*Figure 3* (lead II).—A case of exophthalmic goitre (case 8) showing sinus tachycardia with well-marked P and T waves.

*Figure 4* (lead II).—This is from the same case above after onset of auricular fibrillation. T is prominent and the fibrillary waves are also seen.

*Figure 5* (lead II) (case 9).—A case of atherosclerosis and aortic regurgitation, showing regular sinus rhythm with negative T. P waves are prominent. P-R interval is normal.

*Figure 6* (lead II).—Same case as above after onset of auricular fibrillation. Fibrillary waves are shown as (f). T waves are very difficult to be made out.

*Figure 7* (lead II).—A case of syphilitic myocarditis showing auricular fibrillation with rapid heart rate.

*Figures 8, 9 and 10* (leads II).—A case of chronic myocarditis and auricular fibrillation (case 10). These were taken on three different occasions and show the effect of digitalis in reducing the heart rate without affecting the

auricular fibrillation. The depression of the T wave is prominent in figures 9 and 10.

*Figure 11* (lead II).—A case of rheumatic infection of mitral and aortic valves (case 3), showing auricular fibrillation with ventricular extra-systoles both right and left.

(1) *Rheumatic infection.*—When a case of mitral stenosis or regurgitation develops auricular fibrillation the electrocardiogram changes are:—

1. Right ventricular preponderance.

2. Disappearance of P wave.

3. Prominent (f) fibrillary waves. Cookson from an analysis of one hundred records came to the conclusion that in mitral stenosis the fibrillary waves are of large or moderate amplitude. He says that the size of the fibrillary waves could be made use of in distinguishing a rheumatic from a non-rheumatic case of auricular fibrillation when it is impossible to distinguish the condition clinically. In this series only 6 cases showed prominent fibrillary waves.

4. The contour of the T wave is modified either by the super-imposition of the fibrillary waves or by the administration of digitalis. T will usually be negative in leads II and III and sometimes very deep.

5. Alteration in the QRS complex is shown by the prolongation of the interval over 0.1 second. In this series there is one case of bundle-branch block. This condition is rare and according to Cookson indicates a bad prognosis.

6. Coexistent ventricular premature contraction can be seen if present.

When fibrillation stops and normal rhythm is restored P will be prominent in leads II and III, and occasionally in lead I. P-R interval will be prolonged (greater than 0.2 second). There is right ventricular preponderance. T will usually be negative depending on the amount of digitalis administered.

(2) *Myocarditis.*—Electrocardiogram changes are:—

1. Left ventricular preponderance. Some cases might not show any ventricular preponderance at all.

2. Low voltage in all the three leads or in leads II and III. This indicates myocardial damage.

3. Presence of fibrillary waves. The amplitude of (f) will be small when compared with that of the rheumatic group (Cookson, 1930).

4. Contour of the T will depend upon the amount of myocardial damage, and the amount of digitalis administered.

5. Prolongation of the QRS complex. We had one case of arborization block in our series.

6. Coexistent ventricular premature contraction can be seen if present.

When normal rhythm is restored left ventricular preponderance if any will be present. P-R interval may be increased or normal. The contour of the T will depend on the amount of myocardial damage. Some cases may show evidence of an old coronary lesion.

(3) *Thyrotoxicosis*.—Electrocardiogram changes when auricular fibrillation sets in are:—

1. Rapid ventricular rate.
2. Left ventricular preponderance.
3. (f) Wave. It is difficult to make out the fibrillary waves.
4. Prominent T wave.

When fibrillation stops, and normal rhythm is restored, the electrocardiogram shows sinus tachycardia, small P-R interval, prominent T wave and left ventricular preponderance.

#### *Differential diagnosis*

1. *Irregular extra-systoles*.—It is sometimes difficult to distinguish auricular fibrillation clinically from irregular extra-systoles. We had a patient who was diagnosed clinically as auricular fibrillation by the irregularly irregular pulse but his electrocardiogram showed irregular extra-systoles. In such cases the diagnosis can be made only by the electrocardiogram.

2. *Sinus irregularity*.—Sometimes this will cause difficulty in diagnosis of auricular fibrillation. An old man was admitted with signs of left ventricular failure and he had a slow irregular heart. The condition was clinically diagnosed as slow auricular fibrillation; the electrocardiogram showed this to be a case of sinus irregularity and the P wave was present. These are the two cases which caused difficulty in the diagnosis of auricular fibrillation at the bedside. The bedside diagnosis was corrected by the electrocardiogram.

*Mechanism of auricular fibrillation*.—According to Lewis, auricular fibrillation is due to circus movement. The impulse starting from the sino-auricular node normally spreads round the orifice of the superior and inferior vena cava and meets and neutralizes itself. In auricular fibrillation it passes only one side, meets with no resistance and the wave goes on in a circle round and round. The refractory period of the muscle is less than the time taken for one complete circle and so the wave goes on in a continuous circus movement. The condition is the same in case of auricular flutter also, with the difference that in fibrillation the circle is small and the path is irregular; whereas in the case of flutter the path is regular and the circle is wider. Recently it has been shown by Brams that when the auricles are separated by crushing the inter-auricular septum after the induction of auricular fibrillation, the fibrillation or flutter persists. This experimental observation is certainly against a single circus movement causing the auricular flutter or fibrillation. East and Bain

(1936) think that these observations would not invalidate the theory of the circus movement provided multiple movements are possible.

#### TREATMENT

##### (A) *Auricular fibrillation with congestive heart failure*

(1) *Rest*.—There must be both physical and mental rest. The position chosen should be the most comfortable for the patient. Chloral (15 to 20 grains) and bromides (15 to 20 grains), or morphia ( $\frac{3}{4}$  grain) with atropin 1/100 grain can be given for rest and sleep.

(2) *Diet*.—Fruit juice and sugar water. The diet can be increased as the condition of patient improves with restriction of salt and water.

(3) *Bowels*.—To be opened by glycerine enema.

(4) *Drugs*.—(a) Tincture of digitalis 45 minims to 2 drams in 24 hours, depending on pulse rate. Digitalis is stopped when the pulse rate comes down to 70 per minute.

(b) *Diuretics*.—Ammonium chloride (15 grains), diuretin (15 grains), three times a day. Salyrgan, 1 c.cm., intramuscularly, given once a week.

##### (B) *Symptoms of congestive heart failure have disappeared but fibrillation is still present*

(1) Digitalis is given when the pulse rate is over 70 per minute. The action of digitalis is to reduce the ventricular rate.

(2) Quinidine stops the circus movement and thereby the auricular fibrillation.

Quinidine acts by (1) increasing the refractory periods, and (2) slowing the rate of conduction.

In the first instance fibrillation stops and normal rhythm is restored. In the second instance fibrillation is not affected.

In case 1 the patient was first put on digitalis and, later, on quinidine 3 grains on the first day, 3 grains on the second day and 24 grains on the third day (in 24 hours) at 6-hourly intervals. Fibrillation was controlled for one week only but reappeared again. In case 5 quinidine could not control the auricular fibrillation. The initial dose is usually 3 to 5 grains and is a test dose to find out the idiosyncrasy of the patient to quinidine. Fifteen to 30 grains are given in 24 hours. The drug is continued till normal rhythm is regained. Although toxic symptoms such as tachycardia, embolism or sudden death are described there were no accidents in this series by the administration of quinidine.

There were only very few cases in which quinidine could be given since they were of more

(Continued at foot of opposite page)



## ARSENIC IN HUMAN TISSUES AND EXCRETA

By RAI BAHADUR K. N. BAGCHI, B.Sc., M.B. (Cal.),  
D.T.M. (Cal. and L'pool), F.I.C.

*Chemical Examiner to the Government of Bengal*  
and

H. D. GANGULY, M.Sc.

*Officiating Assistant Chemical Examiner, Calcutta*

ARSENIC is an important poison both for homicidal and suicidal purposes. As it is widely distributed in nature exact information about the amount of arsenic normally present in human tissues, excreta and foodstuffs is of great importance in medico-legal investigations. When it is present in large quantity in the viscera of a suspected case of arsenic poisoning, no difficulty arises in giving a definite opinion as to the cause of death, but if only a trace of arsenic is detected the question of normal arsenic content of the tissues comes in, that is to say, the investigation centres round the question—how much of the total amount of arsenic is of extraneous origin and how much normally occurs in the tissues or in the stomach contents?

This problem has been further complicated by researches on the arsenic content of common

(Continued from previous page)

than five months' duration or associated with congestive heart failure.

(3) In addition to digitalis, diuretics such as ammonium chloride or diuretin with weekly injections of salyrgan may be given to the patient.

### (C) Auricular fibrillation with slow ventricular rate

Digitalis is not given in these cases, only diuretics and weekly injections of salyrgan.

### Acknowledgments

My thanks to Dr. G. Dinker Rau and Dr. P. Kutumbiah for the valuable advice and kind permission to utilize the clinical material, case records, and the electrocardiograms of the patients admitted into their wards; to Dr. P. Ramachandra Rao for the post-mortem notes of case 7 and to Dr. P. Kesavaswamy for the prints of the electrocardiograms.

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foodstuffs. It has been found that sea-fish and some crustaceans are very rich in arsenic. Some of the prawns (sea-prawns as available in the London market) contain as much as 1.2 grains of arsenic (as  $\text{As}_2\text{O}_3$ ) per pound of edible portions (Chapman). It is sometimes believed that the symptoms of gastro-enteritis which some people develop after taking these crustaceans indicate a mild form of acute arsenic poisoning.

A thorough and systematic study on the arsenic content of the common foodstuffs and human tissues and excreta is therefore necessary for clinical as well as for forensic toxicology, but so far no serious attempt has been made in this direction. We worked out the arsenic content of some of the common foodstuffs, including meat and vegetables (Bagchi and Bose, 1935), but the arsenic figures obtained by us were found to be low in comparison with those of Chapman (1926), Cox (1925) and other European workers. The method of analysis adopted in that investigation was the same as that of Chapman with whom the senior author had the privilege of working for a considerable time on this subject. It is therefore evident that there is a vast difference between the conditions here and those prevailing in European countries regarding the distribution of arsenic in foodstuffs and possibly in the human tissues and excreta. As men and animals obtain arsenic through food, and as the common articles of the Indian diet, especially the vegetables, have been found to be poor in arsenic, the normal tissues and excreta of Indians must necessarily contain less arsenic; this is borne out by our analytical figures shown in the annexed tables. The importance of equipping ourselves with the necessary data for a correct expression of opinion may be realized from an interesting case (quoted by Leschke, 1934) of a pharmacist in France who was sentenced to deportation for poisoning his wife with arsenic because small amounts of arsenic were detected in her viscera. It transpired later on in course of researches on this important subject that the amount of arsenic which was found in her body did not exceed the limit for the normal arsenic content of human tissues and the man was released after 11 years. This case is an eye-opener to all clinical toxicologists and medico-legal chemists. Some time ago JJ. Young and Collister of the Allahabad High Court acquitted a person sentenced to death by the lower court for murder by arsenic, and observed in their judgment that 'traces of arsenic might legitimately be present in the viscera of a large number of dead bodies. Arsenic is present in some food substances, such as glucose'. In this case about 0.182 grain (or 11.6 mgm.) of arsenic (as  $\text{As}_2\text{O}_3$ ) was present in the portions of viscera which were sent to the chemical examiner for analysis.

In the beginning of our investigation the method of analysis adopted was that of Marsh-Berzelius modified by Chapman. The necessary



oxidation of the organic matter was brought about by means of nitric and sulphuric acids (Ramberg's method). Considering the accuracy, easy applicability and cheapness of the Gutzeit method as recommended by the British Pharmacopœia this method was adopted after checking some of the results by both methods. Further improvement was effected by warming the Gutzeit flask to 40° to 60°C. as recommended by Davis and Maltby (1936). For complete reduction a 'pre-treatment with sulphurous acid' as suggested by these and other authors is also useful, but in our hands the reduction with hydriodic acid (A.O.A.C. method, 1936) proved to be the best one. Stannous chloride which is added for reduction as a routine measure does not serve the purpose so well.

In this investigation only those cases in which death was due to street accident, shooting, drowning, etc., were selected for our experiments. As the viscera of about 1,000 individuals are examined annually in this laboratory, there is no dearth of good cases for selection. It is not known if any of these cases used to take arsenic in some form or other for treatment or for any other purpose, and naturally a question may arise if the arsenic found in the various organs of these cases is really the normal arsenic content or is due to its ingestion in the form of a medicine. As a solution of this problem we have managed to examine viscera of patients who were given arsenic in course of

treatment in the hospital (*vide* table II). In such cases the arsenic content is much higher than that of the normal cases (*vide* table I). On the other hand, in cases of fatal arsenic poisoning the amount of arsenic present in the tissues is in abundance and varies very widely in different cases (*vide* table IV). In a six-month foetus (*vide* table III) no arsenic was detected in any tissues except a trace in the bones. In babies from one day to one year old only a small amount was detected in the liver. These findings confirm the theory that the source of arsenic in our tissues is the food we take. The mother's blood although very poor in arsenic may be held responsible for traces which we detected in the leg bones of a five-month foetus and in the liver of a full-term child (cases 1 and 4 in table III). Arsenic found in the viscera of babies from five to twelve months old (cases 2 and 3) must have come from food.

A sample of human milk was analysed and found to contain 0.048 mgm. of  $As_2O_3$  per litre. It is interesting to note that the placenta is fairly rich in arsenic (no. 22 in table I) and it may therefore be inferred that arsenic, when circulating in the blood, especially after a diet with an appreciable amount of arsenic, is held back by the placenta and is retained there, leaving the foetal tissues practically free from arsenic.

Arsenic is also normally present in the urine, but the amount appears to vary widely in individual cases. It is present in the faeces in

TABLE I

*Arsenic content of normal tissues—fresh tissues taken from cases of drowning, shooting, hanging, etc.*

Number	Tissues	Number of cases examined	ARSENIC (AS $As_2O_3$ ) PER KILO, IN MGM.		ARSENIC (AS $As_2O_3$ )		REMARKS
			Minimum	Maximum	Average per kilo in mgm.	Average per pound in grains	
1	Liver ..	12	1.8	2.5	2.05	0.014	Nil in two cases.
2	Kidney ..	12	0.75	1.0	0.82	0.0057	
3	Stomach ..	11	0.07	0.5	0.34	0.0024	
4	Spleen ..	5	Nil	0.06	0.024	0.00017	
5	Small intestines ..	7	0.25	0.5	0.41	0.0029	
6	Large intestines ..	6	0.37	0.62	0.5	0.0035	
7	Heart ..	5	Nil	0.05	0.03	0.00021	
8	Lungs ..	5	Nil	Nil	..	..	
9	Blood ..	3	Nil	0.07	..	..	
10	Brain ..	5	..	0.04	..	..	Nil in four cases. Heart blood from P. M. table.
11	Muscles ..	6	0.12	0.25	0.19	0.0013	
12	Bone ..	5	1.6	2.12	1.83	0.0128	
13	Tooth ..	5	1.6	2.0	1.76	0.0123	
14	Hair ..	5	1.2	1.62	1.29	0.009	
15	Nail ..	4	0.8	1.25	1.01	0.007	
16	Skin ..	5	1.25	1.75	1.50	0.01	
17	Thyroid gland ..	5	1.25	1.5	1.3	0.0091	
18	Mammary glands ..	5	1.5	2.5	1.76	0.012	
19	Ovary ..	2	0.05	0.12	0.085	0.0006	
20	Uterus ..	2	..	Nil	..	..	
21	Testis ..	2	Nil	..	..	..	
22	Placenta ..	3	0.75	1.1	0.95	0.0066	

TABLE II

*Arsenic content of tissues of persons stated to have taken arsenic for medicinal or other purposes*  
 Arsenic (as  $\text{As}_2\text{O}_3$ ) per kilo in mgm.

Number	Age, sex, etc.	Liver	Kidney	Stomach	Small intestines	REMARKS
1	A.-I. F., 19	13.0	6.4	0.87	1.0	Died two weeks after the last injection of a course of neosalvarsan. Suicide by oxalic acid.
2	H. F., 19	3.3	3.0	0.75	..	Died six days after the second injection of 2 c.c. solusalvarsan. She had vomiting and purging with unconsciousness setting in three days after the injection. Urine contained 5.4 mgm. of arsenic per litre.
3	H. M., 30	8.4	6.3	275.0	..	Died in the hospital as a result of dagger wounds in the abdomen received in the course of a fight in a brothel. It is probably a case of taking arsenic by mouth as an aphrodisiac. 34.3 mgm. of $\text{As}_2\text{O}_3$ were obtained from his stomach content.

A.-I. F. = Anglo-Indian female. H. F. = Hindu female. H. M. = Hindu male.

TABLE III

*Arsenic content of tissues of foetus and infants*  
 Arsenic (as  $\text{As}_2\text{O}_3$ ) per kilo in mgm.

Number		Liver	Kidney	Stomach	Heart	Muscle	Lung	Bone
1	A full-term baby killed immediately after birth.	A trace	Nil	Nil	..	..	..	..
2	A five-month-old baby throttled to death.	0.12	..	..	..	..	..	..
3	One-year-old baby. Cause of death not known.	0.15	..	..	..	..	..	..
4	A six-month foetus—found in a dust-bin.	Nil	Nil	..	Nil	Nil	Nil	A trace.

larger quantity, but so far no definite information is available in the literature on this subject. In our investigation both urine and faeces were carefully collected and examined by the same method. About 500 c.cm. of urine from a 24 hours' collection and 25 grammes of fresh faeces were taken for analysis. It will be seen in table V that individual variation is more marked in urine than in faeces; for example, the arsenic content of the urine varies from 0.004 to 0.075 mgm. while in the faeces it varies from 0.17 to 0.50 mgm. A few samples of faeces were dried to constant weight and it was found that a factor of 4.52 was fairly constant for conversion of the result of a fresh sample of faeces to that of a dry one. The figures given in these tables indicate the arsenic content of fresh faeces only.

As the source of arsenic is food, it is likely that the arsenic content of urine and faeces varies in different communities (*viz.* Hindus, Mohammedans, Anglo-Indians, etc.), but the number of cases examined by us does not justify the formation of any definite opinion on this important question. There is, no doubt, a tendency to such a variation which would have been more marked if a larger number of cases were examined. The average arsenic content of the urine in our series of cases is 0.023 in Hindus, 0.031 in Mohammedans and 0.03 in Anglo-Indians, while that of faeces is 0.22, 0.25 and 0.35 mgm. respectively. The amount eliminated through the urine is, on an average, about 0.03 mgm. in 24 hours. A further investigation with special reference to the Indian diet is in progress.

TABLE IV

*Arsenic content of tissues of persons killed by arsenic (homicidal or suicidal cases)*  
 Arsenic (as  $\text{As}_2\text{O}_3$ ) per kilo in mgm.

Number ..	1	2	3	4	5
Age, sex, etc. ..	M. M., 18	M. M., 40	H. F.	H. F., 6	H. M., 6
Liver ..	279.3	667.3	2,968.5	333.0	372.0
Kidney ..	188.7	589.4	1,385.3	217.0	238.0
Stomach ..	60.0	903.7	3,250.0	412.0	403.0
Spleen ..	6.7	..	..	15.0	17.0
Small intestines ..	25.3	..	..	..	..
Large intestines ..	32.7	..	..	..	..
Heart ..	2.0	..	..	..	..
Brain ..	22.0	..	..	..	..
Lungs ..	11.6	..	..	28.0	37.0
Thyroid ..	4.3	..	..	..	..
Muscle ..	2.7	..	..	..	..
Bone ..	4.6	..	..	..	..
Tooth ..	4.0	..	..	..	..
Nail ..	2.5	..	..	..	..
Hair ..	2.6	..	..	..	..
Skin ..	19.4	..	..	..	..
Blood ..	0.08	..	..	..	..
Remarks ..	Suicide. Died two days after taking white arsenic.	Suicide	About 80 grains $\text{As}_2\text{O}_3$ were found in her stomach.	Homicide. Died in about 7 hours.	Homicide. Died in about 7 hours.

M. M.=Mohammedan male. H. F.=Hindu female. H. M.=Hindu male.

TABLE V

*Arsenic content of normal urine and faeces*  
 Arsenic (as  $\text{As}_2\text{O}_3$ ) per litre or kilo in mgm.

Number	Name, age, sex, etc.	URINE			FÆCES	
		Arsenic ( $\text{As}_2\text{O}_3$ ) per litre, in mgm.	Arsenic ( $\text{As}_2\text{O}_3$ ) in 24 hours, in mgm.	Arsenic ( $\text{As}_2\text{O}_3$ ) per pound, in grain	Arsenic ( $\text{As}_2\text{O}_3$ ) per kilo, in mgm.	Arsenic ( $\text{As}_2\text{O}_3$ ) per pound, in grain
1	B., M. M., 30	0.03	0.031	0.00021	0.28	0.002
2	A. S., M. M., 28	0.026	0.025	0.00018	0.25	0.00175
3	M. N., M. M., 34	0.075	0.081	0.00052	..	..
4	M. K., M. M., 28	0.032	0.035	0.00024	..	..
5	M. A., M. M., 24	0.028	0.028	0.00019	..	..
6	K. H., M. M., 26	..	..	..	0.37	0.0026
7	M. H., M. M., 25	0.024	0.028	0.00017	0.23	0.0023
8	M. L., M. M., 26	0.018	0.0185	0.000126	0.20	0.0014
9	M. I., M. M., 27	0.018	0.0186	0.000126	0.20	0.0014
10	H. J. B., A.-I. M., 21	0.05	0.05	0.00035	0.50	0.0035
11	H. A., A.-I. M., 21	0.03	0.03	0.00021	0.35	0.0024
12	C. D. B., A.-I. M., 23	0.024	0.026	0.00017	0.30	0.0021
13	S. K. E., A.-I. M., 21	..	..	..	0.28	0.002
14	C. H. J., A.-I. M., 22	0.028	0.033	0.00019	0.24	0.0017
15	L. D. R., A.-I. M., 24	0.02	0.021	0.00014	..	..
16	S. D., H. M., 24	0.024	0.0236	0.00017	0.2	0.0014
17	S. C. P., H. M., 25	0.02	0.022	0.00014	..	..
18	A. K. G., H. M., 34	0.016	0.0155	0.00012	..	..
19	S. K. H., H. M., 24	0.024	..	0.00017	..	..
20	B. K. G., H. M., 30	..	..	..	0.2	0.0014
21	M. K. G., H. M., 34	0.016	0.0134	0.00012	..	..
22	R. C. S., H. M., 28	0.06	0.066	0.00042	..	..
23	I. S. J. B., H. M.,	0.004	0.005	..	..	..
24	H. D. G., H. M., 34	..	..	..	0.37	0.0026
25	N. D., H. M., 36	0.018	..	0.000126	0.17	0.0012
26	S. K. U., H. M., 33	0.016	0.017	0.00012	0.18	0.00126
27	S. M., H. M., 45	0.03	0.03	0.00021	0.2	0.0014

M. M.=Mohammedan male. H. M.=Hindu male. A.-I. M.=Anglo-Indian male.

### Summary

Arsenic is present in human tissues and excreta. The liver contains the largest amount (2 mgm. per kilo). Bone and tooth come next. The amount found in blood is almost negligible. Fœtal tissues contain no arsenic while the placenta is fairly rich in arsenic.

The placenta appears to possess the power of holding back arsenic when present in mother's blood in appreciable quantity. Persons taking arsenic orally or intravenously for treatment or other purposes show three to six times more arsenic in their viscera. In fatal cases of arsenic poisoning (homicidal or suicidal) the amount of arsenic in the viscera is enormous—may be as much as 1,500 times.

In urine the average arsenic content varies from 0.02 to 0.03 mgm. per litre in persons belonging to different communities. The amount

found in the fœces is about 10 times the average limit in the urine. The total amount eliminated through the urine is about 0.03 mgm. in 24 hours.

*Acknowledgments.*—I wish to thank Major D. Ahmed, O.B.E., M.B., V.H.A.S., A.I.R.O., police surgeon, Calcutta, and his assistant, Dr. A. K. Mukherji, for kindly supplying me with some of the viscera for this investigation.

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## A Mirror of Hospital Practice

### A CASE OF COMPLETE ENCEPHALOCELE AND SERIES OF DEVELOPMENTAL DEFECTS IN THE SAME FAMILY

By D. V. KOLOLGI, M.B., B.S.

Gadag

I RECENTLY saw a child in whom there was complete absence of the parietal and occipital bones and imperfectly developed frontal bone,



Fig. 1.

the brain being only covered by the dura mater, a case of complete encephalocele (figure 1).

On enquiry it was found that the first child of the marriage, now a boy of about eight years, was born

without skin over the spine in the lumbo-sacral region, showing a large raw surface. As the child grew, the skin gradually covered the raw surface. Now a scar about three-quarters by half an inch can be seen in the region. On pressing the finger in the region of the scar a depression can be felt indicating defect in the spinal column. The boy is quite healthy otherwise (figure 2).

The second child, a female, was said to have been born with spina bifida. The fingers of both the hands were said to have been clenched. The left side of the



Fig. 2.

body was less developed and smaller in size than the right. The left shoulder was drooping. It lived for two years and then died of 'fits'.

The third child, also a female, was born with a big head (hydrocephalus?) and was stillborn. The father does not know whether the child had any developmental defects in the spine, as it was born in a distant village.

The fourth was born prematurely in the fifth month with the membranes complete.

The fifth child, a female, was stillborn with the spinal cord exposed in the dorsal region. The exposed surface was said to be about the size of the palm of the hand.

The sixth child is the one referred to above.

One occasionally sees a single child in a family with defects of some kind, but the other children are usually healthy. But as far as I can ascertain it is very rare to meet with such a series of developmental defects in the same family.

## SOME UNCOMMON AFFECTIONS SEEN AT AN EYE CLINIC

By C. V. KRISHNASWAMI, M.B., B.S. (Mad.),  
D.O.M.S. (Lond.), F.R.C.S.E.  
Bangalore City

### 1. *A case of complete dislocation of the eyeball with evulsion of the optic nerve*

A boy, aged about seven years, was eating sugar-cane at a spot where cane was being milled. Due to a sudden fright he ran, stumbled and fell down, hitting the right side of his face against an iron spike. He was taken to the nearest hospital in the evening, where first aid was given and he was brought to the Eye Clinic next morning. The eyeball (figure 1) was dislocated



Fig. 1.

forwards, with a certain amount of congestion and chemosis of the conjunctiva, glazed appearance of the cornea, a dilated and inactive pupil and loss of perception of light. A small external wound was present on the outer orbital margin, through which a fracture could be felt, though x-ray finding was negative.

An attempt was made, after the usual cleansing procedures, to push back the globe into its place and retain it in position by suturing the lids together over it, the idea being to save the globe for cosmetic reasons, though sightless. But two days later it was noticed that the bulge was greater, the lids were forced apart and

the sutures were cutting through. Enucleation was, therefore, performed. On cutting the muscular attachments to the eyeball the latter simply slid out bringing with it the whole length of the orbital part of the optic nerve, it having been torn asunder at the optic foramen. The patient made an uneventful recovery after the enucleation.

### 2. *A case of intra-ocular hydatid cyst causing total atrophy of the eyeball and orbital contents*

A low-caste boy, aged about twelve years, was admitted with a history of protrusion of the eyeball (figure 2) of about three months' duration. The anterior end of the tumour was covered by a black eschar which suggested that it might be the shrunken remnant of a disorganized eyeball at the extremity of a tumour of the optic nerve. But poulticing for a few days cleared it up and left a smooth and clean ocular conjunctiva, thereby revealing that it was an intra-ocular tumour, though there was no sign of the cornea, iris and pupil. During operation shelling of the tumour was fairly easy in the anterior half of the orbit, the tumour separating clean off the bony orbit up to which it had expanded. The enucleation at the posterior part became very difficult owing to the depth and want of room, until finally its wall got nicked

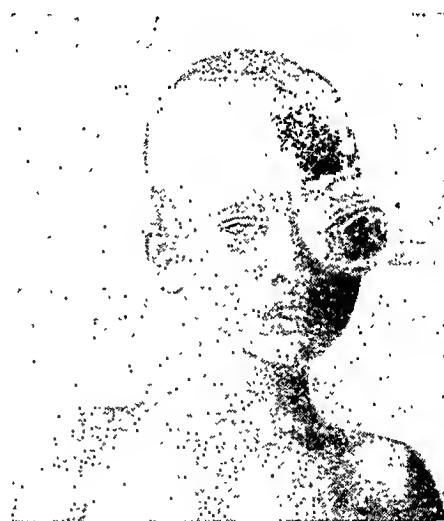


Fig. 2.

inadvertently and a clear fluid gushed out. It then became easy to excise the collapsed cyst wall which extended close up to the optic foramen. It was then found that barring a few flattened-out muscular fibres in the situation of the levator palpebrae superioris and the superior rectus no other ocular or orbital structure was visible. A total pressure atrophy of all these structures had occurred. On opening into the cyst the pearly endocyst was exposed and proved its nature.

A second case, a low-caste woman of twenty years may here be referred to, though differing in its nature. She came in with a history of proptosis of about a week's duration. The eyeball was pushed upwards and forwards, the conjunctiva was red, congested and somewhat chemotic and there was pain and tenderness. It was diagnosed as an orbital cellulitis and an incision was made over the swelling, but only a clear fluid welled out. A few days later the endocyst was extruded and the diagnosis was established. This cyst was entirely extra-ocular and the patient recovered completely after the endocyst came out.

### 3. *A case of fibroma of the optic nerve*

A boy, aged about five years, was brought into hospital with a history of a swelling and protrusion of the left eye of gradual onset and many months' duration. A solid tumour, almost hard in consistency and smooth in contour, was palpable behind and above the eyeball

which was, as will be seen in figure 3, pushed down and outwards and in a state of *phthisis bulbi*. There was no enlargement of glands and no general symptoms. The boy was quite healthy otherwise. A diagnosis of fibroma of the optic nerve of the intra-dural variety was made; the fibroma was enucleated with the shrunken globe. Pathological report confirmed the diagnosis. He made a good recovery after the operation.



Fig. 3.

#### 4. A case of sarcoma of the orbit

A female patient (figure 4), aged about 18 years, gave a remarkably short history of only a month's duration.

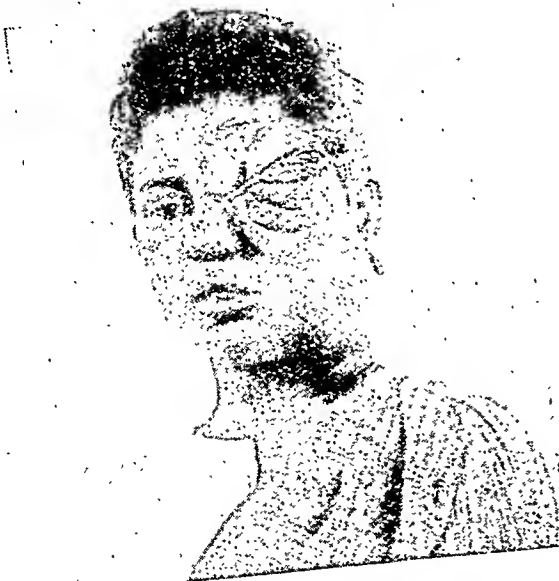


Fig. 4.

Within this period the growth was said to have attained the alarming proportions it presented. There was a foul fungating ulcer extending from about the region of

the fundus of lachrymal sac to nearly the hair line on the forehead. The eyeball was greatly displaced outwards and the conjunctiva showed cauliflower-like excrescences. The left side of the face and the parotid and submaxillary regions were all the seat of a firm swelling and in the last-named area the growth had broken out on the surface. The fungating spots bled readily on touch. The left nasal cavity was blocked by extension of the growth. A tentative diagnosis of sarcoma of the ethmoid was made and a bit was removed for pathological examination from the lachrymal region. The report declared it to be small round-celled sarcoma. The case, being inoperable, was discharged at her own request.

#### 5. A case of myiasis of the lachrymal sac

A woman, aged about 45, came into the clinic one morning with a mass of dirty rags swathed round the right side of her face and exhaling a stench that could be smelt several yards off. On removal of the dressings the eye itself was seen to be perfectly normal while in



Fig. 5.

the region of the lachrymal sac a dirty, ragged and festering ulcer was seen swarming with maggots. The history was that an abscess formed at the spot and was treated with a paste of green leaves. The maggots were killed *in situ* by application of chloroform on swabs, picked out with forceps and a large boric poultice applied. The further progress of the case is unknown as she did not put in a second appearance at the clinic. It is believed that the lachrymal sac is a very unusual site for myiasis to occur and hence the case is reported.

#### 6. A case of dacryops

Figure 5 shows a man well over 70 years of age, who was admitted into hospital with a history of a slow-growing swelling in the left orbit of several years' duration. He had first noticed it when of the size of a small marble. There was no pain or other kind of discomfort; nor was there any diplopia, as is explained by the slow growth. The tumour projected upwards and outwards from the left orbit like a horn, was hard, and no fluctuation could be elicited. Total removal together with an elliptical piece of the super-abundant skin over



it was done. On cutting into the tumour it was found to be a cyst with walls about one-eighth inch thick and filled with a watery fluid in which floated a number of tiny, shining cholesterol-like flakes. By the time the eye was released from the bandage it had resumed its normal position and the patient had no diplopia.

These cases, being of sufficient rarity, the only cases seen in the course of over four years at a clinic where the daily average of new cases was about 30, i.e., about 10,000 cases in the year, have been considered worthy of record.

In conclusion, the contributor wishes to record his gratitude to the successive superintendents of the Government Headquarters Hospital, Madura, for kindly according sanction for photographing these cases.

## ACUTE VOLVULUS

### A CASE REPORT

By H. S. WATERS, M.A. (Camb.), F.R.C.S. (Eng.)

CAPTAIN, I.M.S.

*Costebelle, Bombay*

THE following case of acute volvulus of the sigmoid colon presents several unusual features and is worth publishing :—

The patient H. N., a well-developed Arab seaman from Socotra, aged 30, was admitted with a history of pain in the abdomen and vomiting for three days, together with absolute constipation. He had had a similar though milder attack three years previously, which was cured by starvation. This time the pain was of sudden onset with vomiting, continuous in nature but with acute exacerbations and chiefly referred to an area to the right of and below the umbilicus.

On examination his skin was cold and clammy, and he had a pulse rate of 90, respiration 22 and temperature 97°F. There were old pigmented scars of branding over the hypochondriac and epigastric regions and a cruciform branding mark over the hypogastrium one day old. The upper abdomen was distended and tympanitic and did not move well with respiration, while the whole abdomen was tender and somewhat rigid, tenderness being most marked to the right of and below the umbilicus. The other systems appeared normal.

This was obviously a case of 'acute abdomen', either a perforated viscus with peritonitis, or obstruction, and was operated on without further delay.

**Operation.**—On opening the abdomen under spinal anaesthesia a large distended coil of gut about 4½ inches in diameter at once presented. The caecum was found collapsed and the distended coil was therefore at first thought to be the small intestine. Further examination showed that there was a volvulus of the sigmoid colon which had rotated through 270° in an anti-clockwise direction with the enormously distended loop, mainly up under the left lower ribs, pressing on the stomach and causing the upper abdominal distension and urgent vomiting. The small intestine was collapsed and the condition of the loop itself was quite good. The volvulus was untwisted and a stiff rectal tube was passed up from the anus well into the loop and stitched to the anal margin. No attempt was made to fix the loop in position with sutures, chiefly owing to the collapsed state of the patient; and the abdomen was then closed. The patient was given intravenous saline injection throughout the operation. He rallied well after the operation and made a rapid recovery.

**Comment.**—Unusual features in this case are:

(1) Age (30) of the patient, the usual being from 40 to 60 years.

(2) The early and persistent vomiting continuing for three days. This is not usual in this type of obstruction.

(3) Situation of the volvulus up under the ribs and pressing on the stomach, and the anti-clockwise direction of the twist.

(4) Rigidity and tenderness most marked in the right lower part of the abdomen, instead of on the left side.

## AN APPARENTLY SUCCESSFUL CASE OF CARDIAC MASSAGE

By G. B. W. FISHER

CAPTAIN, I.M.S.

*Civil Surgeon, Darjeeling*

CASES of resuscitation after stoppage of the heart beat by the method of cardiac massage have been reported from time to time but I think it a sufficiently rare event as to warrant publication of the following notes :—

Mrs. K. B., aged 20 years, came to the General Hospital, Chittagong, for confinement of her second baby.

**Previous confinement.**—Birth of a dead baby after prolonged labour. Her perineum was badly torn. A repair operation was done in this hospital about a year ago.

**Present confinement.**—The membranes ruptured with the onset of labour and it was decided to apply forceps on account of primary uterine inertia which was contributed to by a cicatricial contraction in the vaginal canal about two inches above the vulva. Under chloroform anaesthesia this was manually dilated and as forceps were being applied the patient suddenly stopped breathing. The forceps were removed, artificial respiration was immediately started and as the pulse was very feeble 1/30 grain of strychnine was injected. The patient failed to respond and the heart stopped beating. Ten minims of adrenalin were injected into the heart and repeated after one minute. There was no response from the heart after a further minute. The baby at this point drew attention to itself by vigorous struggling and after it had been confirmed that there was no heart beat a hasty Caesarean section was performed and a living baby delivered. Before the placenta which was adherent was removed cardiac massage was done by compressing the heart between the right hand under the diaphragm and the left hand over the precordia. This was done easily but considerable upward pressure of the right hand was required as the heart tended to slip upwards out of reach. It began to beat after about four minutes' stoppage, at first feebly but after about half a minute forcibly. With the return of the heart beat the uterus started to bleed. The placenta was quickly removed and the uterus and abdomen sutured, 1 c.cm. of pituitrin having been given into the uterine muscle while the placenta was being removed.

When the abdomen was closed the condition of the patient was fairly good, respirations though jerky with an occasional gasp were quite deep and slow, and the pulse though fast, about 100 per minute, was of good volume and tension. The patient was, however, cold and one pint of hot rectal saline with glucose was given at once and a slow sub-mammary saline instituted. About half an hour after resuscitation the patient vomited a quantity of fluid. This welled from the nose and mouth like the terminal vomit of a case of acute dilatation of the stomach. Every effort was made to keep the throat dry but some fluid was certainly aspirated.

About four hours after the operation the patient was found to be having tetanoid spasms. They were controlled to some extent with whiffs of chloroform and an injection of sodium luminal. An immediate catheter specimen of urine showed plenty of albumin though this had been examined previously and found free. It

is thought that the spasms were due to a mild post-partum eclampsia, the effects of which were accentuated by the injection of strychnine.

Towards evening, about seven hours after reviving, signs of pulmonary oedema developed in both lungs. Venesection was performed, and four-hourly injections of atropine and digitalin and an intravenous injection of 25 per cent glucose and calcium gluconate were given. Next morning the temperature was normal and the clinical condition seemed hopeful. The kidneys were working well and though the urine still contained albumin there was no return of convulsions. On the evening of the second day broncho-pneumonic patches developed in both lungs and she became very restless. Respiration was hurried, the temperature rose to 104°F. and the pulse, 140 per minute, was full and bounding. There was no improvement from venesection.

Digitalin, calcium gluconate and intravenous glucose were given without effect, and the patient died at 11-30 a.m. on the third day, with signs of right heart failure, approximately 50 hours after revival.

Death was due to post-operative pneumonia after an apparently successful resuscitation by cardiac massage.

The child is alive and seems healthy so far.

## DISSECTING ANEURYSM—REPORT OF A CASE

By L. B. CARRUTHERS, B.A., M.D., C.M.

American Presbyterian Mission Hospital, Miraj,  
S. M. C.

A MALE patient, aged 45, a farmer by profession, was admitted to the Presbyterian Mission Hospital, Miraj, on 2nd December, 1935, and died on 7th March, 1936. On admission he complained of severe dyspnoea, cough, epigastric pain and diarrhoea.

The patient had first noticed dyspnoea two years previously; it occurred during the cold weather and on exertion. There was cough also at that time. Shortly afterwards he was ill with severe cough, dyspnoea and oedema lasting for four months during which time he was unable to work. Thereafter, he was apparently well again for about one year when he noticed that the dyspnoea gradually became severe once more, the cough returned and oedema appeared in the legs. He began to notice precordial pain on exertion. The complaints have persisted until the present time.

His mother had died, when he was a child, of pneumonia. His father and his wife had both died of plague 15 years previously. He had no children. His previous medical history was negative except that when he was a young boy he had had an attack of rheumatism. The patient was addicted to *Cannabis indica*.

**Physical examination.**—The patient was very ill, oedematous and orthopnoic. The mind was clear. The pupils were equal and reacted normally. The ears and nose were normal. The teeth were dirty and a considerable degree of pyorrhoea alveolaris was present. The tongue was heavily coated and cyanosed. The pharynx and tonsils were normal. The submental glands were enlarged to the size of peas. The cervical veins were engorged. The chest was wasted and tended to be barrel-shaped. It moved freely and equally on respiration. The lungs were hyper-resonant with diminished breath sounds and medium to coarse râles at the bases posteriorly. The apex of the heart was in the fifth space, 11 cm. to the left of the mid-sternal line. The cardiac impulse could not be seen and the sounds were poorly heard. No murmurs could be made out. The lower border of the liver was three fingers down in the mid-line and it was quite tender and pulsating. The spleen could not be felt. The abdomen was otherwise clear. There was oedema of the legs below the knees as well as of the sacral region. There was pediculosis in both groins. The finger nails were cyanosed. The veins of the arms were prominent and the brachial arteries were thickened, and tortuous. The pulse was 100 per minute, regular and of low

tension. Blood pressure was 115/80 mm. of Hg. The sputum was frothy and occasionally blood-tinged. The retinal picture showed no abnormality.

Urine examination showed an acid reaction, specific gravity 1020, no sugar, a trace of albumin, epithelial cells and a few pus cells. The stool was negative. The Kahn's test was '2-plus'. The blood urea was 25 mgms. per 100 c.cm. The blood picture was as follows: Red blood corpuscles 6,300,000; hæmoglobin 95 per cent; white blood corpuscles 6,000; polymorphonuclears 78 per cent; lymphocytes 19 per cent; mononuclears 3 per cent. The sputum was negative for tubercle bacilli. The Mantoux test was slightly positive. The x-ray of the chest showed increased translucency of the lung fields with low diaphragm and increased hilar markings. The ascending aorta was slightly dilated diffusely whereas behind the ascending aorta there was a large mediastinal shadow which appeared to be an aneurysmal dilatation of the descending aorta. Under fluoroscopy this was seen to be pulsatile.

The patient was kept at absolute rest in bed and put on digitalis, ammonium chloride, glucose and salyrgan intramuscularly and on this regime there was rapid improvement, so that within a week the oedema had gone down and the pulse rate was 68. Injections of bismuth were then begun. On 12th December, 1935, the patient complained of loose stools and this looseness persisted throughout the rest of his stay in the hospital. The stools contained mucus but no blood or pus cells. On the 14th it was noticed that the lower border of the liver was two fingers below the umbilicus and the upper border at the 7th interspace in the nipple line. It was very tender. Between the upper border of the liver and the infra-sternal notch the right ventricle of the heart could be felt beating distinctly. The cardiac impulse was also felt in the 6th and 7th left interspace, the apex being in the 7th space just inside the left nipple line. The blood pressure at this time was 105/65 in both arms and 110/95 in both legs. The dyspnoea, cough and general distress were now obviously worse. X-ray was taken to show the retro-cardiac space. This showed the heart to be displaced downwards and forwards. Above and behind the heart was a large, rounded, fainter shadow, extending from the level of the upper border of the 4th thoracic vertebra to the level of the body of the 9th. There was no erosion of vertebrae.

Considering the x-ray findings and the clinical picture a diagnosis of dissecting aneurysm of the descending aorta was now made, it being considered that the use of digitalis to improve the circulation had but served to worsen the aneurysmal effect. From this time onwards the patient was in continual distress with marked orthopnoea, cough and insomnia. The pulse rate rose to 100 per minute. Towards the end of December there were a few days in which he appeared and acted better. Early in January oedema reappeared and on the 8th he collapsed. Venesection was then done with definite improvement. The left side of the face became swollen and remained so but not the left arm. On the 21st the patient became comatose for a few hours but recovered with stimulants. On 1st February no pulse could be felt in the right arm although it was strong in the left. Thereafter, the condition varied but little. On the 28th the diarrhoea became severe and could not be controlled, and on 7th March he suddenly expired.

The autopsy was performed 18 hours after death. Both lungs showed pleural adhesions over the apices and in the lower axillae. The mediastinal glands were slightly enlarged and calcareous. Ulcers of the bacillary type were found in the colon. The heart showed a moderate degree of hypertrophy and dilatation. The ascending aorta was atheromatous and there was a perforation of the intima and media of the aortic wall on the posterior aspect just below the origin of the left subclavian artery and dissecting downwards between the media and adventitia to just above the aortic hiatus of the diaphragm. The coronary arteries were sclerosed. The post-mortem diagnosis was chronic adhesi-

pleurisy, tuberculosis of tracheo-bronchial lymph glands, bacillary dysentery, arterio-sclerosis of the aorta and coronary arteries, and rupture of the aorta due to arterio-sclerosis to produce a dissecting aneurysm of the last part of the transverse and of the descending aorta.

### Comment

According to Osgood, Gourley and Baker (*Ann. Int. Med.*, IX, 1398; April 1936), although over 400 cases of dissecting aneurysm have been recorded in the literature, only 11 of these have been diagnosed during life. The same authors report Shennan as finding only 6 acceptable cases diagnosed during life until 1933. Five more cases have been reported and these three also reported 2 cases; ours bringing the total to 14 cases diagnosed during life. The following brief résumé of this condition has been taken from the above-mentioned report:—

The aetiology is usually hypertensive cardiovascular disease although some few cases have occurred with coarctation of the aorta and one with a basophile adenoma of the pituitary. The onset is usually determined by some sudden rise in the already existing hypertension. The essential pathology is a rupture of the intima with a splitting of the media. In most instances a secondary rupture occurs externally but in a few cases back into the lumen of the aorta. This secondary rupture is the cause of death in 95 per cent cases. The initial rupture is in the ascending aorta in most cases, about 20 per cent occur in the transverse aorta and 10 per cent in the descending aorta. The length of the dissection varies from a few centimetres to the full length of the vessel.

Clinically the onset is usually with a sudden, severe, tearing pain in the chest coming on after some excitement or strain and in a patient who has had previously evidences of hypertension or coarctation of the aorta. The pain usually centres under the upper sternum and radiates to the back, abdomen, shoulders or arms. It is severe, not readily controlled and is accompanied by extreme restlessness. There may be sudden exacerbations. Evidences of the previous existing hypertension or coarctation will be present and also there may be signs of obstruction of one of the aortic branches (coma, hemiplegia, anaemia, gangrene, paralytic ileus or localized swellings). Sudden death supervenes within a few minutes in 65 per cent cases and in the remainder from a few days to several months. The most suggestive laboratory change is an increase in the ieteric index. The roentgenographic features are a diffuse widening of the aortic arch with diminished pulsation, an enlarged heart, displacement of the oesophagus and trachea to the right and shadows of the dissection along the aorta. There may be fluid at the left base. Diagnosis should not be difficult if the condition is kept in mind. It is based on the history, the pain, and the

laboratory and x-ray findings. The condition usually confused is coronary occlusion. The ieteric index, the x-ray and the character of the pain with absence of pericarditis and typical electrocardiographic findings will help to differentiate. The prognosis is grave and the treatment symptomatic.

In the case reported no history of pain was obtained. The condition had probably been pre-existent before admission and the betterment of the circulation attendant upon the use of digitalis in the congestive heart failure probably increased the extent of the dissection. Death was due to an intercurrent bacillary dysentery.

### Summary

A case of dissecting aneurysm of the aorta, diagnosed during life by the roentgenographic findings and confirmed by autopsy is reported.

## HÆMATEMESIS IN A CASE OF MALARIA\*

By H. AHMED, M.B. (Cal.)

Resident Surgeon, Sambhunath Pundit Hospital, Calcutta

K., aged 32 years, Hindu male, was admitted into the Sambhunath Pundit Hospital on 25th April, 1937, with the history of having vomited blood three times during the previous night and passed blood per rectum.

*Condition on admission.*—Temperature—98.2°F., respiration 24 and pulse 82 per minute. Volume—not good. Extremities—cold. Mena once in my presence. Abdomen moving with respiration. Slight tenderness in the upper part of the abdomen. Spleen and liver not palpable. History of indigestion with pain in the abdomen for some time. Nothing abnormal detected in the lungs. No history of fever previous to admission. No difficulty in micturition, urine clear.

On the following day mæna continued, and the condition did not improve in spite of the administration of hæmostatics. Pulse was feeble and rapid. Temperature went up to 100.2°F.

Blood examination on the 27th, while the patient had slight fever, showed presence of many benign tertian malaria parasites. Hæmoglobin was 50 per cent and leucocytes 11,250 per c.mm.

*Treatment.*—25th April. Injections of glucose, normal saline, horse serum and calcium gluconate. Foot end of the bed raised. Ice bag to the pit of the stomach.

26th April. Injections of calcium gluconate, congo-red solution and camphor in ether. Foot end of the bed raised.

27th April. Injection of quinine bihydrochloride gr. x intramuscularly.

28th April. Repeated the quinine injection. General condition of the patient improved and there was no more hæmorrhage.

29th April. Alkaline and quinine mixture.

Later, the patient developed parotitis which subsided with local application of belladonna.

*Point of interest.*—The history, signs and symptoms of the patient on admission were suggestive of hæmorrhage from gastro-duodenal ulcer but a diagnosis was not made till the blood was examined.

[*Note.*—It would be of interest to investigate the case further to exclude the presence of peptic ulcer as well.—*EDITOR, I. M. G.*]

# Indian Medical Gazette

AUGUST

## CHEMOTHERAPY IN BACTERIAL INFECTIONS

IN medical writings of sixty years ago, in the days when Lister, Pasteur and Koch had impressed the medical profession with the importance of their studies and the scientific world was beginning to accept the bacterial theory of the cause of disease, there are many naïve and, from our present-day point of view, pathetic anticipations of the future of the treatment of bacterial diseases—it was only necessary to introduce formalin, carbolic acid or some other powerful antiseptic into the blood stream, the bacteria would be killed, and all would be well. It did, however, occur to some workers, notably Ehrlich, that it might not be as simple as all that, and that the antiseptics which killed bacteria might also be toxic to the tissues of man, the words *parasitotropic* and *organotropic* were invented, and the science of chemotherapy was born.

There was at first much theoretic discussion but little practical outcome, then when success came to Ehrlich and his co-workers it was not the bacteria but the spirochaetes which were the first victims of this new science, and with the introduction of salvarsan and the other arsphenamine compounds that soon followed, chemotherapy might be said to have entered its practical phase. The protozoa were the next to succumb, the leishmaniae, the trypanosomes, the entamoebae and finally the plasmodia, but until about two years ago no success of note had been scored against any pathogenic bacterium. Now at last we appear to have found a group of substances that are of definite therapeutic value in certain bacterial infections.

A dye substance, 4-sulphamido-2:4-diamino-azo-benzene hydrochloride, or 'prontosil', which when taken by the mouth rapidly attains a comparatively high concentration in the blood, was found to have a very striking effect in prolonging the life of mice artificially infected with a many-times lethal dose of virulent strains of  $\beta$ -haemolytic streptococci, and also to have a very marked beneficial effect in human puerperal sepsis; a closely allied substance 'prontosil soluble', a preparation that was suitable for administration parenterally, also had the same action on both the artificially-infected mouse and on man. It was however found that comparatively high concentrations prontosil had no effect on these same  $\beta$ -haemolytic streptococci. It was then discovered that a simpler compound para-amino-benzene-sulphonamide, now generally called

sulphanilamide, was not only equally effective in the septicæmia in mice but that *in vitro* in dilutions up to 1 in 18,000, at least, it had a bactericidal action on  $\beta$ -haemolytic streptococci, and the suggestion was made that the action of prontosil depended on this substance being reduced to sulphanilamide in the body. The actual mode of action of sulphanilamide is still not properly understood and the findings of different workers have been at variance.

Although there is the evidence that *in vitro* the substance will act on streptococci in dilutions which it is easily possible to attain in the blood, there is also evidence that the body tissues play an important part in the destruction of the organisms: for example, though it is possible by administering sulphanilamide to prolong for many days the life of mice that have been given a virulent streptococcal infection that invariably kills untreated controls within 48 hours, yet these mice, which have practically no natural resistance to this infection, will eventually die when the treatment is suspended, whereas man, who has some natural resistance to this infection, can be completely cured.

An interesting point about the action of sulphanilamide is its specificity. It has been shown to have its greatest action on  $\beta$ -haemolytic streptococci of serological group A. In some streptococcal infections of low mouse-virulence the drug has practically no action and similarly in man produces no therapeutic effect in the milder infections, those of *Streptococcus viridans*, for example.

A very great advantage of these new substances is that they are very rapidly absorbed and that in most instances oral administration is quite as satisfactory as parenteral. The few exceptions are, when very large initial doses are indicated and nausea may be produced if the drug is all given by the mouth, when there is continuous vomiting, and in those rare instances when the drug is not absorbed by the stomach. In fact, the position is very much the same as that of quinine in malaria.

Sulphanilamide can be given in large doses without the production of any adverse by-effects, and such by-effects as have been observed have not been serious nor even alarming. A certain degree of acidosis, transient nausea, and cyanosis, occasionally with sulphæmoglobinæmia, has been reported; there is some suggestion that this last condition is associated with the giving of saline purgatives. Pyrexia as a direct result of the administration of sulphanilamide is not uncommon and is an unfortunate complication, as it clouds the clinical picture. Jaundice also occurs.

The doses that have been given by different workers vary considerably. An average dose for an adult appears to be 5 grammes of sulphanilamide in the first 24 hours, a dose of 50 milligrammes per pound of body-weight; some

workers have given larger doses without ill effects and again others have found smaller doses sufficient.

More recent work has demonstrated that sulphanilamide may have a wider scope of therapeutic activity than was at first expected, and good results have been reported in meningococcal meningitis, in gonococcal urethritis and in certain pneumococcal infections. Further, allied compounds, for example diaminosulphone and dinitrosulphone, have now been synthesized and show promise of being even more powerful therapeutically than sulphanilamide.

It is thus apparent that in the treatment of bacterial infections a very definite start has

been made along a new and promising line. The drugs that have been introduced by different manufacturers appear to be harmless to the human organism, but it is as yet too early to state categorically that they are harmless when administered over long periods. Again, though we have not ascertained their limitations as therapeutic agents, there is considerable indication that they are specific in action and that in many bacterial infections they are quite without action; they should not therefore be used indiscriminately in any and every condition, which may or may not be caused by some bacterial infection, or disappointment is likely to follow their use.

## Special Articles

### THE CALCUTTA FILTERED WATER SUPPLY\*

By A. K. SEN, B.Sc., M.B., D.P.H., M.R.C.P.

*Director, Bengal Public-Health Laboratory, Calcutta*

WHEN some time ago I was requested by our secretary to speak on the Calcutta filtered water supply, although I did not say 'no', I thought it was my duty to explain to him the competency I could claim to speak on the subject. I should say, not a great deal, not much more than that of speaking on the water supply of Calicut. In the Bengal public-health laboratory we carry out systematic examinations of most of the municipal water supplies in Bengal. The results of examinations of others carried out at the district laboratories are regularly reported to me. The sole exception is the water supply of Calcutta controlled by the Calcutta Municipal Corporation. When intestinal diseases are rife, their ravages long-continued and the wail of the tax-payer for protection grows loud and insistent, the local government is forced to take action and naturally make a reference to the government laboratory for assessing the true state of the supply of drinking water in this great city. It is on such occasions that I have to work intensively for the short period of a month to a month and a half and bring to the notice of the local government the condition of the filtered water as I find it to be in the course of my examinations. I have now, I believe, clarified my position with regard to the filtered water supply of

Calcutta. With these preliminary remarks I give you a short history of the development of the Calcutta filtered water supply.

*History.*—In the early days, i.e., in the beginning of the eighteenth century, Calcutta was dependent on the river and on tanks and wells for its water supply. The Great tank or the Dalhousie Square tank, enlarged and deepened, provided the supply of sweet water to the garrison at Fort William and for British Calcutta near its banks. In the other parts of the city the numerous private wells were dangerous sources of supply. The privately-owned tanks were foul and insanitary. The river water from October to March was said to be wholesome for drinking. From April till the break of the rains it was saline. The river water drawn at the ebb tide and preferably about the tenth day of the moon was generally used by the Hindus. The water when it was turbid was clarified by alum and strained through cloth. Some people collected rain water and used it when the river water became turbid during the rainy season. The poorer classes, not living near the river, used tank water. The Europeans often used stored rain water. A reputed firm of pharmaceutical chemists used water from Laldighi (now known as the Dalhousie Square tank) for the manufacture of soda water. A red hot iron was immersed in a jar of water to kill off the germs, and the water was then filtered through sand and charcoal.

The water thus treated was also supplied to persons proceeding on the homeward voyage to England. A lady who took a stock of it did not find the potable water at the port of Liverpool surpassing it either in sweetness or transparency.

\* Being a lecture delivered under the auspices of the Calcutta Public Health Society, on 29th June, 1937.



Between the years 1805 to 1836 large tanks were excavated in College Square, Cornwallis Square, Wellington Square, Wellesley Square, in Mirzapore and in other parts of the town for providing supplies of sweet water to those areas. Under the then existing conditions these tanks proved to be an inestimable boon.

In 1820, a pump was installed at Chandpal Ghat for supplying river water by gravitation through open masonry aqueducts to a small portion of the town. Water could be taken from the aqueducts by pail. The supply was also used for street watering and for replenishing water of the tanks in the vicinity. In the year 1854 the system of aqueducts was extended to other areas.

In the year 1848, the legislature first explicitly recognized in an act the need for the supply of pure wholesome water.

On obtaining reports on the preliminary analysis of water of the river at Cossipore, Palta and Chinsurah, in the course of which it was found that the water at Cossipore was sewage-tainted, the water supply committee of the corporation, in the year 1865, approved of the Palta scheme formulated by Mr. Clark, the engineer and secretary to the corporation. The committee made recommendations for carrying out the scheme and also for the levy of a compulsory water rate, on the completion of the works. The first Calcutta waterworks was completed in 1869 and taken over by the corporation in 1870. The works were designed to supply 6 million gallons per day to a population of 400,000 persons and consisted of a pumping station on the river bank, six large masonry settling tanks each with a storage capacity of  $4\frac{1}{4}$  million gallons in which as much silt as time permitted was deposited. The water then gravitated to 12 slow sand filters each 200 feet by 100 feet. The filtering medium consisted of a 30-inch layer of very fine sand below which was a 6-inch layer of coarse sand, the whole resting on a bed of pebbles varying from fine gravel to stones as large as eggs. Each tank was calculated to let through a million gallons in 24 hours. The filtrate through these was collected in a central well and from there gravitated through a 42-inch cast iron pipe into an underground reservoir at the Tallah pumping station, situated at the northern boundary of the city. From Tallah the water was delivered by pumping partly to consumers and partly into another underground reservoir at Wellington Square. The distribution was completed by a pumping station at this point. The reservoirs at Tallah and Wellington Square had capacities of 1 and  $6\frac{1}{4}$  million gallons, respectively.

The total cost of the first works was 66 lakhs against an estimate of 57 lakhs. In 1870, all the principal lanes and streets were piped and over 500 street standposts were erected, the total length of piping being  $111\frac{1}{4}$  miles.

With some subsequent additions the supply of filtered water did not exceed 7 million gallons daily and it soon became evident that the works must be considerably enlarged.

New works were started in 1888.

A new pumping station was erected at Palta at a distance of half a mile from the old station. For settling purposes four large *kutchra* reservoirs were made with a useful capacity of about 83 million gallons. Twenty-four additional filter beds were also constructed each 200 feet by 100 feet. These new filter beds were said to be simpler and cheaper in construction than the old filter beds and were reported to be equally efficient. A new 48-inch main was laid between Palta and Tallah to carry the increased supply of water. New pumping engines were installed at Tallah and the reservoir accommodation was increased from 1 to 3 million gallons. An additional pumping engine was installed at the Wellington Square station and a new pumping station was constructed at Halliday Street with an underground reservoir of 4 million gallons capacity and another for the southern suburbs at Bhowanipore.

The new works were completed in 1891 and were designed to furnish a daily supply of  $20\frac{1}{2}$  million gallons. The system of supply was of the intermittent type. The total length of mains and service pipes in connection with the new system was 315 miles.

By 1893 however the maximum available supply was being used and as the demand increased with the growth of population, the water pressure fell and complaints of scarcity became numerous.

During the period 1891 to 1900 two more settling tanks were provided at Palta and considerable extension of the mileage of filtered water supply was made. The following years were a period of schemes and counter-schemes by the Government and municipal engineers and their assistants, in which the question of making the supply continuous, and the related important question of prevention of waste received serious consideration.

The corporation was of opinion that if the water supply was to be overhauled a satisfactory solution of the problem for another 25 years (that is up to 1930) must be found, and considered 30 gallons per day per head of population as an adequate allowance. It was further considered that the population of Calcutta in 1930 would not exceed  $1\frac{1}{4}$  millions, so that an ultimate supply of  $37\frac{1}{2}$  million gallons would be required. With the provision of  $2\frac{1}{2}$  million gallons for the outlying municipalities a daily supply of 40 million gallons of filtered water would be ample provision for the probable needs for the next 25 years.

Mr. McCabe who joined the corporation as chief engineer in 1903 submitted a scheme in



1906 in which he proposed to increase the supply by putting sufficient pressure on the existing mains.

The corporation sanctioned the scheme in 1907 and the local government in 1908.

The objects of the scheme were, the increase of supply, the improvement of distribution, and the prevention of wastage.

These were attained in the following ways—

(1) A more powerful intake plant was installed at Palta, five large filters were constructed, the pressure pumping plant at Palta was increased, and the pumping plant at Tallah was strengthened.

(2) A nine million gallon elevated reservoir was constructed at Tallah for distribution of water by gravitation.

A new trunk main 72 inches in diameter from Tallah to the city was laid (McCabe main).

(3) Waste water meters were introduced and stop and sluice valves fixed.

The most striking feature of the new project was the elevated reservoir. Its essential function was to enable the pumps to be worked at constant head and speed, instead of being pressed or retarded to conform to fluctuating demands. The reservoir was a steel tank at a height of about 110 feet from the ground level, having a capacity of 9 million gallons and was provided with a flat terrace roof. It was divided into four independent compartments, one or more of which could be thrown out of work for cleaning or repairs without interrupting the town supply. The works were executed and the overhead tank brought into use in May 1911.

On the completion of Mr. McCabe's scheme, the Halliday Street pumping station, the Wellington Square station and the station at Bhowanipore were shut down. The immediate result was an increase of supply from 28 to 32 million gallons, the average consumption per head of population was 32.8 gallons per day and the length of filtered water mains was over 361 miles. Continuous high pressure throughout the 24 hours could not, however, be secured owing to excessive draughts during the full-pressure hours in the morning and afternoon.

The daily supply had risen to 36 million gallons in 1913-14. After the deliberations of several committees and sub-committees it was decided in 1919 to bring out an expert from England to suggest measures for improvement.

Mr. George Moore came out to Calcutta in 1920 and started investigations. He drew up a scheme which aimed at supplying 100 million gallons of filtered water per day to Calcutta and suburbs, a supply of 80 gallons per head per day being ensured for the population in 1941.

The scheme included the following important modifications or additions to the system:—

- (i) Additional intake pipes at Palta,
- (ii) two additional settling tanks, 90,000,000 gallons each,
- (iii) thirty-three additional filter beds, 2 million gallons capacity each,
- (iv) an entirely new pumping station for pumping filtered water from Palta to Tallah,
- (v) an additional 5 feet main from Palta to Tallah,
- (vi) an additional underground storage tank at Tallah, having a capacity of 12 million gallons,
- (vii) new engine house and engines at Tallah,
- (viii) the distribution by independent mains to well-defined zones; all the pumps at Tallah would deliver into a steel chamber from which all the independent mains to the zones would start.

The scheme of Mr. Moore, with whom Mr. Bateman was later on associated, has not yet been fully carried out. The present supply to the city varies from 66 to 70 million gallons per day, the *per capita* allowance is said to be 25 gallons per day and the mileage of water mains 503.

*The chemical quality of the water.*—I have attempted to acquaint you with the landmarks in the development of the Calcutta filtered water supply. I shall now place before you a few problems in connection with that supply.

The first is the chemical quality of the water at the source. The river Hooghly is a tidal river. It has been common knowledge from the very earliest times that the river water at Calcutta is saline from April till the break of the rains. During the investigations before the inauguration of the waterworks, waters from different points of the river were examined. These examinations were carried out not only to ascertain if organic contamination was present in water but also, I should say, to see if the samples taken at such points were consistently sweet.

In recent years the brackishness of the Calcutta filtered water has been complained of by the consumers. Examination of the water from various points of the river are carried out regularly at the Bengal public-health laboratory. The rise in the salinity of water during the pre-monsoon months is very marked at points down the river from Calcutta, the salinity increasing many hundred times the further down the river the samples are obtained. We are not here concerned with such waters. I shall take two places which are 'up the river from Calcutta, Baranagar and Tittagarh. Baranagar is really a suburb of Calcutta. Tittagarh is close to Palta being about two miles below it down the river. The table below shows the rise in the salinity and hardness of the river water from

February till the break of the rains at these two places:—

observations may permit of making a definite statement.

TABLE

*Rise of hardness and salinity of the Hooghly river water from March till break of rains*

		1934		1935		1936		1937	
		Total hardness parts per 100,000	Chlorides parts per 100,000 (salinity)	Total hardness parts per 100,000	Chlorides parts per 100,000 (salinity)	Total hardness parts per 100,000	Chlorides parts per 100,000 (salinity)	Total hardness parts per 100,000	Chlorides parts per 100,000 (salinity)
At Tittagarh close to Palta.	February ..	23.0	2.15	20.0	1.2	24.0	2.0	23.0	1.7
	March ..	20.0	2.5	25.0	2.2	24.0	4.4	18.0	5.1
	April ..	25.0	14.8	28.0	12.1	31.0	15.2	25.0	13.6
	May ..	21.0	10.9	33.0	32.0	35.0	44.0	31.0	21.6
	June ..	24.0	12.4	32.0	29.8	14.0	1.7	..	..
	July ..	11.0	1.0	14.0	1.0	11.0	0.8	..	..
At Baranagar close to Calcutta.	February ..	23.0	1.8	27.0	6.7	27.0	5.4	25.0	1.9
	March ..	28.0	8.4	28.0	22.0	40.0	45.0	21.0	3.0
	April ..	42.5	44.0	37.5	38.0	62.5	98.0	22.0	6.8
	May ..	29.0	24.4	57.5	92.0	75.0	100.0	32.5	20.0
	June ..	32.5	33.0	85.0	137.0	47.5	48.0	..	..
	July ..	8.0	1.1	11.0	2.2	8.0	1.2	..	..

It will be seen that the increase in salinity reaches the maximum in either May or June and that there is a marked, almost dramatic, drop with the onset of the rains, the contrast between the rise and fall being more marked the lower down the river the samples are obtained. From the figures it will also be seen that the rise in salinity was more conspicuous during the years 1935 and 1936 than in the previous years or in the present year. I have no clear explanation of this matter but offer what I consider to be the probable cause. Does the explanation of this marked rise lie in the fact that during the two above-noted years there was great drought up the river during the pre-monsoon months and this, coupled with the prevailing high temperature, so decreased the river volume as to encourage the rush of the flow tide to higher reaches of the river, thus increasing the salinity of the water? I have no data to support this. The temperature may have soared high and remained persistently high for a longer period during these years but unless the rainfalls at various places up the country, of which the river is the natural drain, are available the relation of drought to the rise of salinity cannot be established.

It will be seen from the tabulated figures that even in 1936 the maximum rise in salinity of the water at Tittagarh did not quite reach the level at which it is considered high and the water tastes brackish.

Should this problem of loss of sweetness of water be considered to loom large in the future of the filtered water supply of Calcutta? Correct data regarding rainfall and further

*Bacteriological quality.*—I shall now take up the consideration of the second problem, that is; the bacteriological quality or the purity of the Calcutta filtered water. The Calcutta filtered water is the effluent of 60 slow sand filters. The raw river water after 30 to 72 hours' sedimentation is put on the filters. During the rains when the colloidal matter content is considerable, alumino ferri (1 grain to the gallon) is added to the sedimentation tanks to help clarification.

The filtrate from the filters drains ultimately into the collecting wells and samples are taken regularly from these wells for bacteriological examination.

Given adequate time the reduction of pathogenic bacteria in a water after sedimentation is about 90 per cent. The time recommended so that this high reduction can take place is not less than five days. In Indian conditions the reduction may occur in a shorter period so that the three days' period allowed in the new settling tanks at Palta may be barely enough to obtain the good results.

Slow sand filtration adopted for the Calcutta filtered water is not economic but given properly constructed filters and worked at a slow rate it is the most efficient of the filtration methods to effect bacteriological purification. Satisfactory results are said to have been obtained at Palta from an average rate of filtration of 40 gallons per square foot of filter in 24 hours. In slow sand filters, however, it has been found that if the filtrate exceeds a million gallons per acre per day or 23 gallons per square foot per day its bacteriological quality does not reach a high standard. The bacteriological standard adopted

for the Calcutta filtered water is the absence of lactose fermenters (presumptive *B. coli*) in 10 c.cm., and about two years ago the number of 10-c.cm. portions which used to be seeded for the test could not be said to be adequate. Is it because a strictly high standard had not been adopted in the case of the Calcutta filtered water that the above-mentioned rate of filtration was considered to be satisfactory?

The standard of bacteriological purity of the effluent from the filters and the method of examination did not conform to the recognized standards or methods, either of America or of England. According to the American standard not more than 10 per cent of the five 10-c.cm. portions of a water seeded in McConkey bile-salt lactose broth should show the presence of organisms of the *B. coli* group. The English standard recommended by the Ministry of Health in England is more exacting. I would suggest the adoption of the latter method, that is the seeding of one 50-c.cm. portion, five 10-c.cm. portions and five 1-c.cm. portions in bile-salt lactose broth medium and the enforcement of the American standard, that is, that not more than one of the five 10-c.cm. portions or the 50-c.cm. portion should show fermentation or the presence of presumptive coli. This would be equivalent to a presumptive coli count of not more than two in 100 c.cm. The method of examination certainly should be exact and should conform to a standard method.

Chlorination is not employed for the purification of the Calcutta water except sometimes during the monsoon or if there be a breakdown of the filtration plant. The standard of bacteriological purity of the water at the source cannot therefore be made as exacting as that of a chlorinated water.

It is not known if Calcutta will have subsidiary water purification plants to supply its very large and increasing population. Even now in summer water scarcity, much of which is due to the thoughtless waste of water by the consumers, is definitely a complaint. I should think that extension of the present waterworks, on the same lines, would be undesirable. Subsidiary plants with modern methods of purification would be not only economical but the final water from such plants would satisfy more exacting standards of bacterial purity.

I now pass on to the consideration of the quality of the filtered water as it reaches the consumer.

Clemesha in collaboration with Dr. Pearse, the health officer, made a prolonged investigation. Their report showed that the Calcutta filtered water was of excellent quality during eight months of the year, but during the rains the water was slightly inferior.

In 1935, owing to the report that pathogenic intestinal organisms have been isolated from samples of municipal tap water at the Presidency and the Assam district laboratory, as directed

by the local government, the analysis of the Calcutta filtered water was undertaken at the Bengal public-health laboratory. Two to eight samples of water from the street hydrants from each ward in the city were examined, the total number of such samples being 87. The results of analysis as reported to the government were as follows:—

(1) The total colony count on agar at 37°C. in 48 hours was from six to countless numbers in the medium. The total colony count, however, was as a rule low, being 50 or less than 50 in 60 out of 87 samples.

(2) All the samples showed the presence of presumptive coli in 10 c.cm. and upwards, and presumptive coli was present in all the 5-c.cm. portions. The number of bacteria of the coli aerogenes group was from 25 to 1,800 or more per 100 c.cm. and the smallest quantity of a sample which showed the presence of these bacteria varied from 0.1 to 10 c.cm.

(3) Sixty-five per cent of the samples (57 out of 87) showed the presence of faecal bacilli in 10 c.cm. and upwards, faecal bacilli being present in all five 10-c.cm. portions in the same percentage of the samples.

As the filtered water at the source is not passed unless free from presumptive coli in 10-c.cm. portions, it is clear from the above analytical results that the water deteriorated considerably after it was pumped to Tallah and from there into the city mains.

(1) This deterioration may occur in the passage of the water to Tallah or at the Tallah reservoirs.

(2) It has been suggested that the deterioration takes place as the result of after-growth in the water during its passage through the several hundred miles of the distributory system.

(3) The deterioration is the result of contamination which takes place in the distributing pipes, which, owing to intermittency in supply, let the water pass out during the hours of high pressure and during the low pressure periods suck in, if not the subsoil water, the liquid mud around, which in most places is sewage sodden.

I will discuss each of the above possibilities.

(1) Ten samples of water were collected from the underground reservoirs at Tallah. One of these had to be rejected. In the rest, although some deterioration was found to have occurred, faecal bacilli could be isolated from only three out of the nine samples, being present in these in all the five 10-c.cm. portions.

As the number of samples was very small any deduction from the results obtained may be fallacious but presumably contamination of the water at Tallah is not considerable.

(2) It has been seriously suggested that the deterioration of the Calcutta filtered water is the result of after-growth and in support of this the following lines have been quoted from Thresh's *Waters and Water Supplies*.

'If (a sample of water is) taken after the water has traversed a long length of main or after it has passed a service reservoir even the most efficiently filtered water may give much higher results especially in summer and autumn'.

Now, Thresh is here considering the total bacterial count in agar and is referring to the increase in total count which occurs even in an efficiently filtered water. This increase is logically due to the growth of the common water and soil bacteria which are still present in the water rather than to that of the intestinal types.

In the course of the above reported examinations of the waters from the street standposts it was found that, whereas the total bacterial count in about two-thirds of the samples was 50 or less than 50, the organisms of the faecal types had definitely increased, being present in two-thirds of the samples in all 10-c.cm. portions. Thus, the actual findings lend no support to the contention that the increase is a natural one of the residual bacteria in water in the course of distribution.

In a water after chlorination, when the preliminary germicidal action is over, a second phase occurs in which there is rapid growth of the surviving organisms. This is usually known as after-growth (Race).

When the contact period between chlorination and consumption is short the phase of after-growth is not reached, but when the treated water is stored a long time in service reservoirs after-growths may occur.

Thresh considers that the multiplication, which is very great, is confined to water and soil and bacteria; intestinal organisms, such as *B. coli*, according to his observations, take no part.

After-growths according to Thresh occur in water of low grade organic purity.

The Calcutta filtered water in the first place is not chlorinated; it is not stored in reservoirs for a considerable period because the daily supply to the city is 67 million gallons, whereas the total storage capacity of the reservoirs at Tallah is only 27½ million gallons; neither is the low total colony count indicative of deterioration due to after-growth.

Growths of bacteria do occur in the dead ends of the pipes in the distributory system where the water stagnates. This was seen in the following results of analysis of a drilled dead end :—

Total colony count—910 per c.cm.

Presumptive coli—80 per 100 c.cm.

After-growths have become a problem in several large American cities and a committee of the American public health engineering section was formed to enquire into it. It was not able to ascertain in many instances how much of the bacterial increase is due to pollution and how much to actual after-growth.

(3) To investigate if there was any truth in the contention that in the off- or low-pressure hours suction of contaminated matter into leaky

pipes was the cause of the deterioration of the water, examination of twenty samples of the first morning flow of water was carried out during the investigation, samples of water from the very same hydrants having also been collected at the usual hours, from 9 to 10 a.m., and examined.

The results of examination will be found in the table.

TABLE

*Report on the examination of 20 samples of first morning flow of Calcutta water, collected from street standposts in various wards*

Ward	Total colonies in agar at 37°C. in 48 hours	Number of presumptive coli present in 100 c.cm.	Number of faecal bacilli present in 100 c.cm.
4	363	25	Nil
	26	25	Nil
6	235	50	Nil
	80	50	50
7	1,050	350	250
	79	350	250
8	910	170	170
	18	80	Nil
9	1,260	250	25
	29	50	25
10	165	170	130
	28	50	Nil
11	Countless	80	80
	10	50	Nil
12	73	80	25
	Countless	1,800	1,800
14	224	110	110
	X	60	25
15	97	35	25
	30	70	50
16	410	1,800	250
	124	95	50
17	151	250	25
	60	35	Nil
19	160	50	Nil
	36	35	25
20	166	95	25
	X	50	25
21	Countless	350	350
	X	110	25
22 B	440	50	25
	11	35	25
23	271	35	25
	45	17	13
24	231	50	25
	51	70	Nil
25	83	35	Nil
	80	35	25
27	401	170	170
	25	110	25

Top figure:—Number in the first-flow samples.

Bottom figure:—Number in ordinary morning samples collected from same standposts.

It will be seen that the total colony count in all cases was more than 50 and in the majority many times more. Evidence of definite increase in the faecal bacilli content could be found in 7 out of 20 samples. The results in a few cases were conflicting. The results were vitiated, because towards the end of the period chlorination of the water was started at Palta owing to the disorganization of the filter beds.

### Conclusions

I have presented to you the important results which were obtained from the investigation. You will find that from the data obtained it is difficult to come to any definite conclusion about the cause of deterioration of the Calcutta filtered water.

I shall conclude after drawing your attention to a further matter. Evidence as to the purity of the water supply of a city has been said to lie in the mortality rates from typhoid fever. The following table, showing the effect of chlorination of water supplies in some of the important cities in the U. S. A. and Canada, on typhoid death rates is interesting:—

#### Typhoid death rates per 100,000 population

	Before chlorination	After chlorination
Baltimore	.. 35.2	22.2
Cleveland	.. 35.5	8.2
Philadelphia	.. 18.0	7.0
Montreal	.. 40.0	25.0
Toronto	.. 31.2	7.8
Ottawa	.. 34.0	17.0

A part of the reduction is undoubtedly due to improvements in general sanitary conditions but it was mainly due to chlorination because the decline was sharp immediately following the commencement of the treatment.

I shall now produce for your scrutiny the typhoid mortality figures in the city of Calcutta (Calcutta proper) from 1905 to 1935.

Notwithstanding the fact that Calcutta has been supplied with filtered water during all these years, the mortality from enteric has increased from 75 in 1905 to 746 in 1935 (diagram attached).

The population of Calcutta without the added areas has increased from 810,000 in 1900 to 1,158,000 in 1935 or by 50 per cent, whereas the increase in the mortality from enteric fever in about the same period has been many times more.

The spread of enteric fever in Calcutta may occur readily from the following causes:—

(i) Comparatively few cases seek or find admission to hospital. They continue to be sources of infection throughout their illness and convalescence.

(ii) The distribution of filtered water being inadequate in many areas, unfiltered water or polluted ground-tank water is largely used for domestic purposes.

(iii) *B. typhosus* can be readily isolated from the Calcutta sewage. The sewerage system of Calcutta is water-logged, especially in the low-lying areas of the city. Consequently the surface drains stagnate and overflow and after a moderate shower of rain the water in the streets is a mixture of backed-up sewage, sullage and rain waters.

(iv) Owing to greater facility of communications carriers and convalescent cases possibly enter the city in larger numbers.

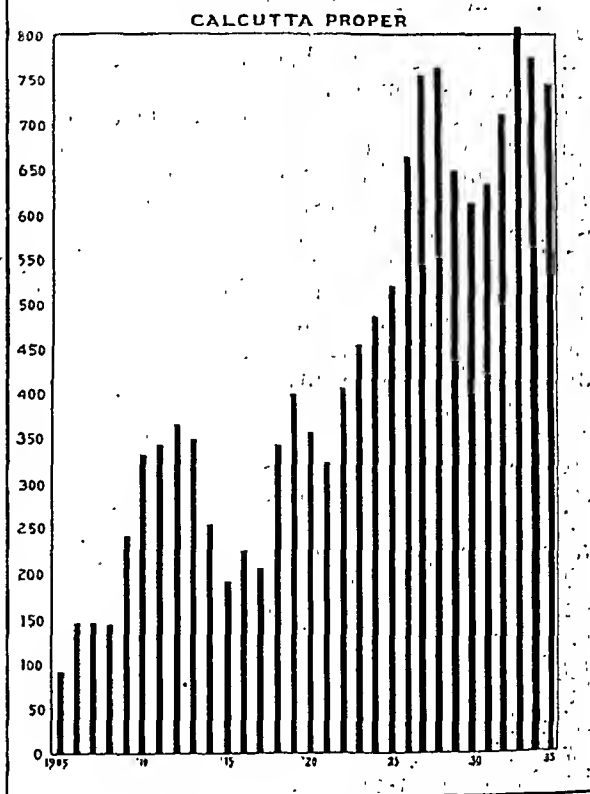
The following significant facts appear in the report of a special committee of the corporation:—

(a) Filtered water mains and pipes in Ganguly Lane were found to have passed through gallery pits and master traps. Water of the house tap at 3, Ganguly Lane, showed on examination faecal bacilli, about a million per c.cm.

(b) Contamination of water occurred in Banskolla Street due to a leak in the gland of the sluice valve.

(c) As a result of underground contamination of water a serious outbreak of acute gastro-enteritis occurred in Chattawallah Gully.

### MORTALITY FROM ENTERIC IN THE CITY OF CALCUTTA. FROM THE YEAR 1905 TO 1935.



(d) As a result of investigation during 1927 the executive engineer gave a list of 21 places where filtered mains passed through manholes and 13 places where leaks were discovered.

It can be said without contradiction that gross local contaminations have produced, from time to time, serious outbreaks of intestinal diseases.

I leave it to you, gentlemen, to consider the presented facts and find a satisfactory explanation for the very large increase in mortality from typhoid fever in Calcutta.

It cannot be gainsaid that a good deal can be done to improve the standard of purity of filtered water as it reaches the consumer.

(Continued at foot of opposite page)

## MEDICAL PRACTICE IN INDIA

## THE ECONOMIC OUTLOOK

By E. SELBY PHIPSON, C.I.E., D.S.O., M.D., M.R.C.P.  
LIEUTENANT-COLONEL, I.M.S.

*Senior Medical Officer, Colony of Aden*

ON 18th February, 1937, in the course of a presidential address to the Lahore Branch of the Indian Medical Association reported by the *Civil and Military Gazette*, Dr. K. R. Choudhri, Honorary Surgeon, Sir Ganga Ram Hospital, Lahore, expressed himself in a striking passage as follows:—

'We are passing through a critical period. Unemployment in the medical profession is day by day increasing and the economic stress is gradually falsifying the grandiose conception of the traditional nobility of the profession. The chief problem for majority of doctors is one of bread-and-butter, and that, indeed, is a problem of great magnitude. Everything else sinks into insignificance. An empty stomach refuses even to recognize the existence of God. It is a well-known fact that 50 per cent of the doctors in private practice in the Punjab are starving; out of the remaining 50 per cent, about 30 per cent are making both ends meet, and only 20 per cent can be said to have a practice worth the name.'

To the writer, whose sphere of work has lain for some years outside the limits of India proper, these words conjure up a tragic picture of the economic conditions of medical practice in the Punjab, where he has spent most of his service in India, and yet it is hardly possible to doubt Dr. Choudhri's sincerity, or question the accuracy of his estimate of the degree of economic distress, painful as it is. Even considered as a local problem of the Punjab, the conditions disclosed in Dr. Choudhri's address seem to cry out with sufficient insistence for an adequate remedy, but the further question arises whether, disturbing as it undoubtedly is, this is merely a local problem, or whether it may not have a wider ambit. The writer has substantial reasons for believing that it has, and the nature of these reasons will become evident from what follows.

Early in the current year (1937) the impending transfer of the administration of the Province of Aden from the control of the Government of India to that of His Majesty's Government necessitated the establishment of a local medical service to fill the posts hitherto occupied by the

officers of the Subordinate Medical Service of the Government of Bombay, who were held, by arrangement with the Government of India, on a supernumerary cadre of that Service. With the transfer of the administration that cadre ceased to be operative, except for a brief interim period, and it became necessary to make arrangements for the relief of these officers and for their replacement by other medical officers recruited *ad hoc*, as it was considered unlikely that a sufficient number of suitable medical officers on the cadres of subordinate Government medical services would be willing to volunteer, even as a temporary arrangement, for 'foreign service' under a different administration.

It was accordingly decided to invite applications for these posts, which numbered 9, with a leave reserve of 2, through press advertisements covering the whole of India. The terms offered were based on the total average emoluments received by officers of the Bombay Subordinate Medical Service under the former conditions, but in the form of a consolidated salary, without any allowances, of Rs. 190—15—285, on a three years' agreement in the first instance, with free unfurnished quarters, the prospect of pensionary rights if eventually appointed to the permanent establishment and fairly favourable leave and passage concessions. The terms, on the whole, were not dissimilar to those current in the British Somaliland Protectorate which recruits its subordinate medical personnel in much the same way. It was open to any registered medical practitioner to apply, whether of the licentiate or of the graduate class.

This advertisement produced a remarkable response. One thousand four hundred and sixty-five applications were received from potential candidates, apart from about a hundred applications from compounders, clerks, veterinary surgeons, accountants, vakils and other non-medical candidates.

The main purpose of the present communication, of which the foregoing is merely a necessary preamble, is to analyse these 1,465 applications in a form which the writer thinks may prove of interest, and possibly of value, to the medical profession in India, in particular to those holding administrative and professorial posts in the various teaching institutions, and lastly to those who, like the writer, have occasion to recruit medical personnel from among the general body of medical practitioners throughout India.

## ANALYSIS OF THE APPLICATIONS

(1) *The number of applications*

The very large number of applications, 1,465 for 11 posts—a proportion of 133 to 1—suggests that to a considerable number of the applicants the initial pay of Rs. 190 a month at least, compared favourably with the income on which they

(Continued from previous page)

I have been greatly helped by Mr. Goode's book, 'Municipal Calcutta', in preparing the portion dealing with the history. I take this opportunity of expressing my thanks to Dr. T. K. Ghosh, Mr. B. V. Ramiah and other officers of the Calcutta Corporation who have kindly supplied me with material information.



could rely in India. It was evident from correspondence with many of these candidates that the prospect of private practice, which was not barred in the advertisement, was an attraction. After a preliminary selection of the 110 candidates who promised to be most suitable had been made, a comprehensive list of the nature and hours of duty of every post in the Aden Service was made, and a detailed description was given of the actual conditions of their work in Aden which was sent to each of the 110 candidates on the preliminary list, and it was pointed out in the statement that, though private practice was not barred, the conditions of service left very little opportunity for cultivating it and little, if any, additional income from that source could in most cases be expected. The 110 candidates were advised to study this frank statement of the duties and conditions of service, and they were requested, after due consideration, to intimate whether or not they were prepared to accept all the terms of service unconditionally. This had the effect of reducing the number to about 95, and it was from this number that a 'short list' was finally prepared.

From a study of the correspondence in connection with these applications, it is evident that the point to which the applicants attached the greatest value was the relative security of a Government Service with the prospects of a pension.

### (2) *The age-distribution of candidates*

This is shown in the table below :—

Ages 20 to 24	..	..	153
" 25 to 29	..	..	499
" 30 to 34	..	..	423
" 35 and upwards	..	..	306
" not stated	..	..	84

The age-period containing the largest number of candidates is 25 to 29, with 499 candidates, closely followed by 30 to 34, with 423 and 35 and upwards, with 306. The inference which the writer is inclined to draw from the figures is that, apart from the enterprising few who apply soon after qualification, it is only after the young doctor has had bitter experience of the difficulties and disappointments of independent private practice that he is led to seek security rather than affluence in the form of Government Service. The number of candidates (84) who omitted to state their age include, no doubt, a proportion who believed that the statement of their age would prejudice their prospects of employment.

### (3) *The community-distribution of candidates*

This is shown in the following table :—

Hindu (Brahmin)	..	..	447
Hindu (non-Brahmin)	..	..	611
Muslim	..	..	196
Sikh	..	..	79
Parsi	..	..	14
Indian Christian	..	..	102
Miscellaneous	..	..	10

The above table does not appear to possess any special significance as it roughly corresponds with the educated community distribution among the general population.

### (4) *Qualifications of candidates*

Nine hundred and ninety-five candidates of the Indian licentiate grade applied for the posts, their distribution according to the several qualifying diplomas being as follows :—

#### (a) *Indian licentiates*

L.C.P.S. (Bombay)	..	..	180
L.M.S. (Madras)	..	..	20
L.M.P. (Madras)	..	..	271
L.S.M.F. (Punjab)	..	..	135
L.S.M.F. (Bengal)	..	..	221
L.M.P. (Mysore)	..	..	12
L.M.P. (Ahmedabad)	..	..	3
L.M.F. (U. P.)	..	..	63
L.B.O. (B. and O.)	..	..	40
L.C.P.M.E.B. (C. P.)	..	..	29
L.B.M.E.B. (Burma)	..	..	10
L.I.M. (Madras)	..	..	1
L.M.S. (Andhra)	..	..	1
M.S.M.F. (Bengal)	..	..	2
L.M.P. (Patna)	..	..	1
L.M.P. (Nagpore)	..	..	2
I.M.D.	..	..	2
I.M.D. (Goa)	..	..	1
L.M.P. (Hyderabad)	..	..	1

Numerically, this list is headed, rather unexpectedly to the writer, by the Madras licentiates, the next being the licentiates of Bengal, Bombay, the Punjab and the United Provinces in that order. The traditional association, extending over nearly a century, of Aden with Bombay might have been expected to be reflected in a preponderating number of candidates from that province, and relatively to the number of licentiates practising in the several provinces this may perhaps have been so, but this the writer has no means of ascertaining.

#### (b) *Indian graduates*

The number of Indian graduates who replied to the advertisements was unexpectedly large, 428, almost one-third of the whole, distributed among the Indian universities as follows :—

Bombay	..	..	120
Calcutta	..	..	89
Madras	..	..	65
Lahore	..	..	93
Lucknow	..	..	25
Rangoon	..	..	1
Mysore	..	..	4
Vizagapatam	..	..	1
Andhra	..	..	13
Patna	..	..	17

It will be seen that the Bombay graduates, unlike the Bombay licentiates, head this list, with the Punjab, Calcutta, Madras and Lucknow next in numerical order. One possible interpretation of these figures is that it is harder for Madras licentiates to make a living than for Bombay licentiates, but graduates in Madras are more content with their lot than their colleagues in Bombay.

(c) *Special Indian diplomas and degrees*

Fifty-three of the candidates possessed special post-graduate diplomas, etc., as under :—

D.P.H.	..	..	..	16
L.P.H.	..	..	..	1
D.T.M.	..	..	..	12
L.T.M.	..	..	..	14
D.G.O.	..	..	..	3
D.L.O.	..	..	..	2
B.D.S.	..	..	..	1
L.D.Sc.	..	..	..	3
B.Hy.	..	..	..	1

(d) *British qualifying degrees and diplomas and British post-graduate diplomas possessed by candidates*

These were unexpectedly numerous and totalled 29, as follows :—

British university degrees		..	..	6
British licentiates.	{	M.R.C.S., L.R.C.P. (Eng.)	..	4
		L.R.C.S., L.R.C.P. (Edin.)	..	5
		L.S.A. (Lond.)	..	2
		L.R.F.P.S. (Glas.)	..	3
British higher diplomas.	{	M.R.C.P. (Lond.)	..	1
		M.R.C.P. (Edin.)	..	3
		F.R.C.S. (Edin.)	..	1
		F.R.C.S. (Ire.)	..	1
		F.R.F.P.S. (Glas.)	..	2
British special diplomas.	{	D.P.H.	..	8
		D.T.M.	..	6
		D.O.	..	1
		D.O.M.S.	..	3

It is sad to reflect on the circumstances which must have led the holders of these relatively numerous British qualifications, some of them of the highest standard, to seek employment on the terms offered. The numbers are, one would think, too large to be accounted for by the occasional 'failures' met with in every walk of life, and in the writer's opinion it is this list, perhaps more than any of the foregoing, which is significant of the degree of financial stress prevalent among independent medical practitioners in India.

## WHAT IS THE REMEDY ?

With but a limited personal knowledge of the current conditions of medical practice in India the writer cannot presume to express any decided opinion on how to remedy the present economic depression.

Dr. Choudhri considers that some or all of the following causes lead to the state of penury in the independent medical profession which he describes so graphically :—

- Over-production at the medical schools, the rate tending to increase year by year;
- the increased cost and length of period of medical education in recent years;
- the resurgence of the Ayurvedic and Unani systems, and the growing challenge of Homœopathy and of the 'faddist' cults; and
- lack of solidarity in the independent medical profession as a whole.

The various measures which Dr. Choudhri advocates by way of remedy may chiefly be summarized in the words 'State subsidy'.

## CONCLUSION

There must be many members of the medical profession in India who, like the writer, would value an expression of opinion by those qualified to speak on the important question of the supply and demand of medical practitioners in India, and if this communication, based on a detached outlook, serves to stimulate a discussion on so grave a problem the writer will be more than satisfied.

The writer gratefully acknowledges the help of his colleague, Dr. N. M. Hodivala, Medical Officer of Health, Aden Settlement, in the preparation of the statistical data referred to in this communication.

## Medical News

## TWENTY-FIFTH SESSION OF THE HEALTH COMMITTEE

The health committee of the League of Nations held its twenty-fifth session from 26th April to 1st May.

Professor Parisot (French) was made chairman for this session, in view of the absence of Dr. Madsen (Danish). The members present at this session were: Surgeon-General Cumming (United States); Professor Durig (Austrian); Colonel Cotter (India), replacing Colonel Russell; Dr. Hojer (Swedish), replacing Dr. Madsen; Dr. Morgan (British) accompanied by Dr. Goodman; Professor Parisot; Dr. Szulc (Polish); and Dr. Tsurumi (Japanese), Associate Member.

The health committee discussed and approved its next three-year programme. The last three-year programme expired at the end of 1936. The new programme is largely a continuation of the work already being done by the health organization. It is divided into two categories: permanent activities and those intended to deal with topical problems.

In the former category may be mentioned the work of the Epidemiological Intelligence Service, the Commission of Biological Standardization, Leprosy and Malaria, and the duties of the health organization under international conventions.

*Epidemiological Intelligence Service.*—The Service of Epidemiological Intelligence and Public Health Statistics, whose programme of work is indicated by its name, was established in 1921. The service was first utilized for Eastern Europe, where severe epidemics were raging, but its work gradually extended to cover the whole world.

The creation at Singapore in 1924 of the Eastern Bureau, with its network of weekly telegraphic and wireless communications with the ports and countries of the East, was an important step forward. Indeed it may be said that to-day all ports of any importance on the eastern coast of Africa, the southern coast of Asia, Australasia and the western Pacific are in close contact with the Singapore Bureau. The Epidemiological Bulletin of that bureau is broadcast weekly in

code and daily in clear. Nine wireless stations send out free of charge these broadcast messages, which may be picked up not only by health administrations in Asia, Australasia and East Africa, but also by ships plying in the Pacific and Indian Oceans.

At Geneva, the Epidemiological Intelligence Service compiles and publishes figures relating to communicable diseases, births and deaths, in all countries and territories of the world for which such data are available. These statistics, which relate to an aggregate population of roughly 1,436 millions (namely, 72 per cent of the world's population), are published in three periodicals:

(1) The *Weekly Epidemiological Record*, which was begun in 1925 and is primarily intended to supply sanitary administrations and port health authorities with the latest data regarding pestilential diseases and quarantine measures taken against them.

(2) The *Epidemiological Report* of the health section, first issued in 1922. As the field of action of the Epidemiological Intelligence Service gradually extended, the statistical tables appearing in this periodical correspondingly increased and grew into their present standard form. As from 1929 detailed articles on selected communicable diseases replaced the short notes on current epidemics hitherto published. Early in 1937 certain changes were made in the presentation and dates of publication of this periodical; the most important feature is undoubtedly the monthly publication of recent figures, together with material for comparison drawn from the mass of statistical material accumulated during the service's fifteen years of activity. The epidemiological articles will in future appear in the health organization's bulletin. Readers of the epidemiological report will henceforth receive them in the form of reprints. The programme for 1937 includes articles on Weil's disease, the prophylaxis of typhus fever and maternal morbidity and mortality.

(3) The *Annual Epidemiological Reports* reproduce the monthly statistical tables of the epidemiological reports in a concentrated form, after figures have been revised and corrected by the competent national authorities. Retrospective tables are also included giving the rates of birth, general mortality, infantile mortality and mortality due to the principal communicable diseases during the last twenty years in countries possessing reliable records of causes of death.

These activities will be maintained and developed in the future. In connection with public health statistics, the international list of the causes of death is being revised by a joint committee composed of six representatives of the International Institute of Statistics and six representatives of the League health organization. This work is necessary as part of the attempt to make national public health statistics internationally comparable. In this connection too, a medical and statistical study, begun in 1936, will be continued on so-called 'health indices'. The object is to find some way of recording in statistical form the state of public health in different countries by indices of 'vitality' (fertility, population) and of 'health' (mortality, morbidity, physical and mental defects). The indices are intended also to relate to the 'environment' (geographical, social and economic) and to the various branches of medical and sanitary activities.

The health committee in 1936 requested its members to collect information in their own countries regarding maternal mortality and maternal welfare. This material will form the basis of a double report, one part technical dealing with the organization of maternal welfare services, and the other medical and statistical dealing with maternal mortality and morbidity and their causes.

**Biological standardization.**—Although the health committee has been engaged upon biological standardization ever since 1921, its work in this field is far from being completed. With the advance of science new therapeutic agents gain acceptance and require to be assayed in terms of some common standard; moreover, certain of the standards already adopted may be open to improvement, whilst others, being of a composite

nature, are liable to be replaced, sooner or later, by the active substance in pure form; finally, in the case of yet other standards, physical or chemical titration may be expected to oust the biological method of assay—possibly in the near future. These considerations must be borne in mind when an attempt is made to delimit the work of the Permanent Commission on Biological Standardization during the next three years.

The results achieved by this commission were reviewed by the Inter-Governmental Conference which met at Geneva in October 1935. Being convinced of the value of such a periodical review, the conference recommended that similar meetings should be convened at intervals not exceeding three years.

If the experimental research work being done internationally under the auspices of the Biological Standardization Commission is sufficiently advanced to warrant it, such a conference may be held in 1939.

Two of the recommendations adopted by the Inter-Governmental Conference call for special attention, namely, that which advocates that the use of the international standards 'should be made effective by the competent authorities of all countries', and that which relates to the setting up of national centres to hold and distribute the international standards, since these were the two resolutions that were communicated to all Governments by the Secretary-General in February 1936.

Replies so far received indicate that 41 countries have adopted or are about to adopt the international standards recommended by the Permanent Commission on Biological Standardization and that 31 Governments have created or are about to create national centres.

The task of the Central Institutes at Copenhagen and Hampstead will thus be simplified as they will henceforth only have to provide for the regular supply to national centres of the requisite stocks of international standards, instead of having, as in the past, to meet demands coming from various laboratories and factories in each country. An effort is now being made to complete this system by inducing those countries which have not yet done so to establish national centres.

It remains to be seen, however, how many of these centres will be in a position themselves to prepare national standards equivalent to the international ones; so as to enable the two central institutes to husband the supply of their own standard substances, which are sometimes prepared at great expense.

It would appear that for some drugs—digitalis; pituitary extract, arsphenamine—no insuperable difficulties will be encountered in preparing national standards. This is not the case, however, for the serological standards, and it is to be expected that the Copenhagen institute will, as in the past, have to supply international standard sera to the great majority of national centres, whose business it will be to preserve these under the requisite conditions of temperature, and distribute them in their own countries to suitable applicants.

In any case, the fact of the adoption of international standards by so many countries demonstrates that the initiative taken by the health organization has been both valuable and necessary. That this work of international scientific collaboration should be continued and extended will appear from the report which the health committee addressed to the council on the work of its twenty-fourth session in February 1937. The report declares that 'biological standardization is an essential function of the health organization, and the latter should have the necessary resources at its command to make provision for the practical work entailed'.

In the field of serology, several questions have to be reviewed from both the therapeutic and the practical points of view.

The standardization of anti-anthrax serum, already examined in 1925, must be taken up again with the collaboration of the institutes at Budapest and Bucharest.

Similarly, the further study of the standardization of anti-swine-erysipelas serum is necessary since earlier comparative assays did not give sufficiently concordant results. This study will be entrusted to the veterinary institutes at Budapest, Cambridge, Stockholm and Zagreb.

Changes in the international standards for tuberculin and staphylococcus antitoxin likewise fall to be considered.

A new field recently explored is that of the anti-snake venom sera. The problem of their standardization is so wide and complicated that it appears wiser at present to limit the study to the anti-viper serum. A preliminary survey has shown that the antigenic properties of the venoms of the African and Asiatic vipers differ to such an extent that the standardization of their anti-sera would involve the establishment of a series of monovalent standards. It would thus appear preferable to limit the study to the European viper. The Copenhagen institute is in correspondence with the European laboratories producing anti-viper serum (Milan, Paris, Zagreb) and is at present endeavouring to work out a method of standardization.

On the other hand, the question of the standardization of anti-cobra serum would seem less complicated, since the South African serum also protects against Indian cobra venom. It should therefore be possible to establish a uniform standard and to secure, to that end, the assistance of the institutes of Bandoeng, Bangkok, Bombay, Johannesburg and Saigon.

Pharmacological standards, as well as those for vitamins and sex hormones, are also matters that come within the next three-year programme of the Biological Standardization Commission.

**Malaria.**—The malaria commission is to take in hand the preparations for an Inter-Governmental Conference on quinine and kindred febrifuges, to be held not earlier than 1939. The question of holding such a conference has been under consideration since 1925. After collecting a considerable amount of documentary material on the quinine requirements of malarial countries and discussing the matter on several occasions, the health committee has now come to the conclusion that a conference of this kind seems not only advisable but necessary. The views of producers and consumers are often considerably at variance and the conference could contribute largely to clarifying the position, with corresponding advantage for malarious populations. In view, however, of the great advance in the production of synthetic drugs, it would be necessary for the conference to take up also the question of these substances. An agenda of the conference would then include generally the following problems: present production as compared with world requirements; cost of production and market prices; relative costs of a plan of co-ordinated measures of treatment and prevention by the administration of drugs, according to the substance employed; and methods of distribution of the various substances.

The malaria commission will issue the fourth general report on the Therapeutics of Malaria based on research work conducted during the last few years under the auspices of the League health organization in Algeria, Italy, Malaya, Roumania and the U. S. S. R.

In view of the steady success of the international malaria courses held in Rome and annually at Singapore since 1934, the health committee considers it advisable to continue holding these courses for the next three years.

**Leprosy.**—In 1929-30 the leprosy commission's contribution to the world-wide campaign for the prevention of leprosy consisted of a survey carried out by its secretary in a large number of leprosy countries in both the old and the new worlds, the organization of the Bangkok conference (December 1930) and co-operation with the conference organized in January 1931 at Manila by the Leonard Wood Memorial.

After these two conferences, which consolidated the results of years of striving for the introduction of more liberal preventive methods and more rational forms of

treatment; the majority of leprologists considered that further progress in this field could only be brought about by new scientific discoveries. Thanks to the co-operation of laboratory and clinical workers, experimental research has made rapid progress in a variety of directions, including bacteriology, serology, biological chemistry and pharmacology. It was to encourage scientific research without losing sight of practical application that the International Centre for Research on Leprosy was founded on 12th June, 1934, at Rio de Janeiro under the auspices of the League of Nations.

At the same time the activities of various important institutions for the study and prevention of leprosy were extended, e.g., the Leonard Wood Memorial, the British Empire Leprosy Relief Association, its largely autonomous branch known as the Indian Council, and the International Leprosy Association.

All this has created a new situation. The leprosy commission of the League health organization has accordingly been requested in connection with the three-year programme to plan its method of action and its relations with the other institutions in the light of this new situation.

In this connection, it is proposed that the League should organize meetings of experts from these various institutions in conjunction with the leprosy commission, with the object of taking up questions *seriatim* so that the main effort could always be concentrated upon some matter of outstanding importance.

These meetings of experts may be expected to recommend questions of particular importance or even urgency to the attention of investigators. For such research the Rio Centre affords first-rate facilities, which make it possible for laboratory work, clinical work and epidemiological investigation to be carried on concurrently.

To European leprologists, whose opportunities for the observation of the disease are restricted, it offers the most accessible field for investigation, while from the point of view of available facilities it is second to none. To centres in other parts of the world (e.g., Bamako, Batavia, Calcutta, Quilon, and the Japanese centres) it offers great possibilities for the exchange of staff and material together with facilities for study in the South American continent. A leprology course might be organized at Rio on the model of the Singapore malariology course, with the co-operation of specialists from various leprosy countries to make it of really universal value.

**Rabies and cancer.**—Collecting and co-ordinating information on cancer and rabies are others of the permanent activities of the health organization which will be continued under the three-year programme.

**Rural hygiene.**—Rural hygiene has also played an important part in the recent work of the health organization.

The development of the work of the health organization in the field of rural hygiene has followed upon the directives formulated in 1931 by the European Conference on Rural Hygiene. This conference in its conclusions emphasized the utility of carrying on studies on the following subjects:—

1. Cost of different types of rural health services as compared with their efficiency.
2. Typhoid infections in rural areas.
3. The expert examination of drinking-water and sewage; methods employed in different countries and possibility of adopting a uniform method.
4. Treatment of garbage and manure to prevent fly-breeding.
5. The hygiene of foodstuffs and in particular the problem of milk.

These different problems were in 1931 brought to the attention of a meeting of Directors of Schools of Hygiene in Europe, which decided to undertake the studies recommended. A number of institutions started work accordingly, each selecting those problems which appeared the most suitable, either from the medical or educational point of view.

Thus all the subjects were taken up for study, although the contributions received from practically all

the institutions dealt particularly with typhoid fever, milk, treatment of manure and the fly problem. This preliminary stage of investigation was followed by special and more detailed study, and a conference of Directors of Schools and Institutes of Hygiene met in Geneva in April 1935 with a view to discussing an appropriate plan of work. The practical aspect and interest of the plan was emphasized and further study was considered desirable to illustrate and complete the following points: fly control, the problem of milk and foodstuffs in rural areas.

In view of the proven value of the European Rural Hygiene Conference, the Indian Delegation, supported by that of China, proposed at the 1932 Assembly that an Inter-Governmental conference on rural hygiene for Eastern countries should be convened as soon as circumstances permitted. The health committee having proposed that the conference should be held in Bandoeng in August 1937, in conformity with the kind invitation of the Netherlands Government, the council in October 1935 accepted this suggestion. Preparations for this conference, at which all but three Governments of Eastern countries will be represented, were entrusted to a commission of three members set up by a decision of the council (January 1936). This commission during the summer of 1936 visited India, Burma, Malaya, Siam, Indo-China, Philippines, the Dutch East Indies and Ceylon. Their report has already been communicated to the countries concerned.

The documentary material prepared for the conference includes national reports drawn up by the public health services of the participating countries and covering the various items on the agenda, namely:

- I. Health and medical services.
- II. Rural reconstruction and collaboration of the population.
- III. Sanitation and sanitary engineering.
- IV. Nutrition.
- V. Measures for combating certain diseases in rural districts.

Most Governments have already communicated the composition of their delegations, which comprise in most cases not only medical and health officers but also representatives of veterinary services, departments of sanitary engineering, agriculture and education.

As regards the American continent, at the Seventeenth Assembly in 1936 a group of fifteen delegations recommended that a conference on rural hygiene should be convened for countries in that continent. This suggestion was approved by the assembly and the council was requested to examine, with the collaboration of the competent technical organizations and the International Labour Office, the possibility of convening this conference at a date allowing of proper preparation. The Mexican Government has recently indicated its readiness to welcome the conference in Mexico City. In view of the time required to prepare for a conference of such importance, the health committee did not consider that it could meet before the end of 1938.

The European conference in 1931 proposed that a new conference on rural hygiene should be convened in five years' time to examine the results achieved and to adopt its recommendations to current problems and to the progress of public health technique.

The Bureau of the Health Committee, in taking up the question of the preparation for this further conference, expressed its opinion to the council that, whereas at the 1931 conference the various problems connected with rural life were approached more especially from the medical and health standpoints, subsequent enquiries had brought out more and more clearly the need for extending the scope to include more general considerations—that is, certain social and economic aspects of rural life.

'The health, social and economic aspects are, in fact, interdependent and, if truly practical and not merely theoretical results are to be achieved, rural hygiene questions must be placed in their general setting—namely, that of rural life—while account must be taken of the factors of all kinds which come into play.'

'It is indeed increasingly evident that to be successful in his efforts the hygienist cannot remain isolated in his field but must seek the collaboration, and endeavour intimately to co-ordinate his own work with that of all the various agencies concerned with the different aspects of a rural community's activities, the life of which represents one coherent whole.'

*Nutrition.*—Since 1925 the health organization has been engaged in the study of nutrition in its relation to public health; the preceding health committee in 1934 included in its three-year programme the drafting of a general report on the problem of nutrition and entrusted this task to Drs. W. R. Aykroyd and Etienne Burnet. This report, intended primarily for public health administrations, defines the rôle of nutrition in public health and preventive medicine; it served as a basis for discussion when, at the Sixteenth Assembly, twelve delegations requested the inscription of this problem on the agenda.

On the proposal of the Australian delegate, the assembly recommended that the health organization should continue and develop its work on nutrition in collaboration with the technical organizations of the League, the International Labour Office and the International Institute of Agriculture; at the same time the Assembly decided upon the creation of a mixed committee of experts in agriculture, economics and public health, with the mandate of presenting a general report to the next assembly on the problem of nutrition in its public health and economic aspects. The Nineteenth International Labour Conference (1935) adopted a similar recommendation.

In October 1936 the health committee, having considered the Burnet-Aykroyd report, decided to set up a technical commission on nutrition. This commission, at its first session in London in November 1935, laid down the physiological bases of nutrition and established the food requirements of human beings during their growth, from conception until adult age. With a view to the application of the recommendations of the committee in different countries and their adaptation to varying geographic, economic and social conditions, the report was communicated to learned societies and social study institutions in various countries (academies of medicine, academies of science, scientific bodies, national commissions specially set up for collaboration in nutrition studies of the League of Nations).

At its second session held in Geneva in June 1936, the technical commission examined the observations communicated by various bodies, and revised and amplified its London report in certain respects. This revised report was communicated to the mixed committee, in conformity with the Assembly's resolution in 1935, and was included in that committee's report to the 1936 Assembly.

The report of the technical commission recommended for further study a list of problems as follows:—

- (a) Assessment of the nutritional state of children.
- (b) Nutritive food requirements during the first year of life.
- (c) Minimum vitamin and mineral requirements.
- (d) Minimum fat requirements.
- (e) The nutritive and 'supplementary' values of the different protein-containing foods, to determine to what extent and in what forms animal protein is necessary for growth and health.
- (f) The relative nutritive value of different cereals according to the degree of milling.
- (g) The extent to which the increasing consumption of sugar is detrimental to health.
- (h) Influence of climate on food requirements.
- (i) The extent to which diets in common use fall below the standards recommended in this report.
- (j) The optimum amounts of milk required at different ages.

The study of questions (a) and (b) was considered by two consultations of physiologists and pediatricians (December 1936), representing the national agencies to whom the technical commission's report had been submitted.



As regards the methods of assessment of the nutritional state of children, the experts recommended different types of survey in accordance with the number of children to be examined. The first type is applicable to the state of nutrition of large groups of children; it is limited to a record of age, sex, physical appearance, weight and height. The second type of survey involves more extensive tests but applied to smaller groups of children. In addition to the tests under type I, a thorough medical examination is recommended as well as an economic and social survey of the families and a study of the dietary of the child. The third type of enquiry, biotypological in character, aims at studying the disturbances affecting the human body owing to a quantitatively and qualitatively deficient diet. The latter type will include various somatometric and physiological measurements, bearing upon the different bodily functions, as well as blood and sensorial measurements and psychological tests.

Several of these different types of study are being carried out in Belgium, France and the Netherlands; others are contemplated in Sweden, Czechoslovakia and Austria and will deal with 50,000, 10,000 and 20,000 children, respectively. Finally, surveys of the first and second types have been going on for some time in the United States, the United Kingdom, Poland and Norway.

A close study is being made of the food requirements during the first year of life. The problems involved have been submitted to the learned societies and scientific bodies in several countries, which, in some instances, have nominated special commissions or rapporteurs for the purpose.

Finally, a general study should be made of the problems under (h) and (i) in order to consider, on the one hand, the extent to which dietaries in common use fall below the standards recommended in the report of the technical commission, and, on the other, what are the differences observed as regards the state of nutrition of people in different countries or in different regions of the same country. Should such differences be found, it would be necessary to determine whether they are essentially due to the influence of climate.

It may be said without exaggeration that the work of the technical commission on nutrition has aroused the greatest interest both in the medical world and outside it. The commission's first report on the physiological bases of nutrition has created a considerable impression not only in Europe but also overseas. Thus, the agenda of the Inter-Governmental conference on rural hygiene in the Far East include items inspired by the commission's report, such as the composition of dietaries, nutritive value of the principal foods, deficiency diseases, the method of their investigation having to be adapted to local contingencies. Likewise the commission's recommendations will be followed in the action following on the study made by Professors Dragoni and Burnet in 1935 in regard to popular nutrition in Chile; the report of these experts is now in the hands of the Chilean Government, and a condensed version of the document will be published in the next issue of the health organization's bulletin.

Problems concerning nutrition cannot fail to figure prominently in the agenda of the conference on rural hygiene in American countries, or in that of the European conference on rural life, both of which will in all probability be held during the mandate of the present health committee. In this case also the recommendations of the technical commission will exert their influence.

The procedure followed up to the present in the study of nutrition by the health organization has produced valuable results in a comparatively short space of time. Since, therefore, it has proved its worth, there is no reason to modify it. Thus the technical commission will remain the pivot of all activity in this field. For specific studies it will, as in the past, have the benefit of the collaboration of groups of specialists or can apply for authoritative opinions to national authorities, leading scientific institutions, learned

societies, institutes and schools of hygiene—the latter carrying out certain field studies on behalf of the commission.

LEAGUE OF NATIONS,  
Information Section.

4th May, 1937.

## UNIVERSITY OF CALCUTTA

### NOTICE

APPLICATIONS are invited from candidates for the 'Darbhanga Research Scholarship' for the year 1937.

The scholarship will be awarded for the purpose of encouraging original research in medicine in its various branches, and all graduates and licentiates in medicine and surgery of the University of Calcutta are eligible to compete for the same. The value of the scholarship is Rs. 50 a month tenable for one year only.

The terms and conditions of the award of the scholarship will be found in the university calendar for the year 1937, pages 268-269.

Applications with full particulars, as required under the rules, should be submitted so as to reach the undersigned not later than 31st October, 1937.

B. B. DUTT,  
Controller of Examinations.

SENATE HOUSE,  
3rd July, 1937.

## DIETARY CONDITIONS IN THE REPAIR OF DISTURBANCES OF THE LIVER

THE fact that the functions of the liver are numerous and complex is fully accepted. At the outset this fact indicates the importance of the alimentary factor in the normal or pathological evolution of these functions.

Diet itself has an influence in determining certain hepatic disturbances. Abnormalities in the metabolism of various basic foods suffice to show the presence of functional abnormalities, and also permit their extent to be measured.

The problem of diet thus appears as of first importance in the correction of disturbances in the liver and likewise in the repair of this organ.

Among the conditions which must be borne in mind for establishing the diet in cases of insufficiency of the hepatic functions are the protein and carbohydrate metabolism, the transformation of fats and the metabolism of water and mineral substances.

Repair of the liver should, naturally, be preceded by arresting the injuries inflicted upon it. Hence the necessity of knowing the maximal degree of tolerance of a given food, in order to avoid exceeding the limits of the functional capacity of the hepatic cell.

This brief summary readily indicates the difficulties of ascertaining the dietary conditions which must be established in any given case. The clinical symptoms present do not always strictly correspond with coexisting types of functional insufficiency. These symptoms are numerous, irregular and of unequal significance.

In view of the fact that not one form, but many forms, of hepatic insufficiency may occur, no rigid dietary formula is possible. It is evident that the necessary modifications of the diet may be very numerous, and almost infinite in number.

For establishing the diet in hepatic conditions, a few general principles may usefully serve as guides. In such cases the reduction of proteins is basic and the limitation of fats is of extreme importance, while an increased sugar intake is necessary, and sometimes vitally imperative.

In spite of the particular preferences and idiosyncrasies of each case, a sort of common basis therefore exists and there is a general minimal type of diet serving as guarantee.

However, only complete biological analysis is capable, in a given case, of indicating the dietary programme.



which will insure complete repair of the abnormal and diseased liver.

This important question of the influence of the diet in hepatic repair will be discussed by Professor Gallart-Mónes, professor of digestive pathology at the Faculty of Medicine of Barcelona, at the International Congress on Hepatic Insufficiency, which will be held at Vichy, 16th to 18th September, 1937, under the patronage of the French Minister of Public Health and in which fifty-one countries will be represented.

#### INDIAN MEDICAL CORONATION HONOURS, 1937

THERE were certain omissions, etc., in the Coronation Honours List published in the June issue of the *Indian Medical Gazette* as no official list was received.

The following are the additions, etc., to the list:—

##### M.B.E.

T. B. Butcher, Esq., Honorary Surgeon-Superintendent, Cottage Hospital, Mussoorie, U. P.

Major F. J. D'Rose, I.M.D., Civil Surgeon, and Superintendent of the Central Jail, Myaungmya, Burma.

B. N. Ghosh, Esq., Medical Practitioner, Bengal.

B. F. Khambata, Esq., Port Health Officer, Karachi, Sind.

Major J. M. Pereira, I.M.D. (Retired), Superintendent, Patna Medical College Hospital, Bihar.

##### Kaiser-i-Hind Medal (Second Class)

Miss D. Chadwick, Matron, Government Hospital for Women and Children, Madras.

Miss E. E. Hutchings, Nursing Superintendent, Dufferin Hospital, Calcutta, Bengal.

Miss M. M. Rossetto, Head Nurse, European Hospital, Ranchi, Bihar.

Khan Bahadur E. S. Bharucha, Honorary Secretary, Poona Branch, Indian Red Cross Society.

D. K. Görey, Esq., House Surgeon, Wadia Mission Hospital, Poona, Bombay.

E. W. Wilder, Esq., Medical Officer, Albert Victor Hospital, Madras, Madras.

*Bar to the Kaiser-i-Hind Medal (Second Class)*

L. P. Fernandes, Esq., Chief Medical Officer, Father Muller's Charitable Institutions, Kankanady, Mangalore, Madras.

##### Kaiser-i-Hind Medal (Third Class)

Miss D. P. Das, Maternity Supervisor, Medical College Hospital, Patna, Bihar.

C. E. Kachchap, Esq., Medical Officer, St. Barnabas' Hospital, S. P. G. Mission, Ranchi, Bihar.

S. Nath, Esq., Medical Practitioner, Delhi.

##### Rai Bahadur

Mr. B. P. Mazumdar, Assistant Director of Public Health, Bihar.

##### Vaidyaratna

Kaviraj P. C. Rath, Puri Town, Puri, Orissa.

##### Sardar Sahib

Sardar Narinjan Singh, Sethi, District Medical Officer of Health, Lahore, Punjab.

Mr. Kapoor Singh, Senior Sub-Assistant Surgeon, Civil Hospital, Myanaung, Henzada District, Burma.

Jemadar Sapuran Singh, I.M.D., Sub-Assistant Surgeon, Residency Dispensary, Kashmir.

##### Khan Sahib

Jemadar Fazal Haque, I.M.D., His Britannic Majesty's Vice-Consul, Birjand, Khorasan.

##### Under C.I.E.

Read 'R. H. Candy' for 'R. D. Candy'.

##### Under O.B.E.

Read 'J. Rodger' for 'J. Rodeer'.

## Current Topics

### Epidemiology of Epidemic Dropsy

By R. B. LAL, M.B., B.S., D.P.H., D.T.M. & H., D.B.

and

S. C. ROY, M.B., D.P.H.

(From the *British Medical Journal*, 29th May, 1937, Vol. I, p. 1110)

EPIDEMIC dropsy belongs to the group of obscure diseases, like tularæmia, which are little known outside their endemic homes. None the less this disease is of much interest to students of tropical medicine, and particularly to those of us who work in this part of the world. It is by no means a minor problem in the provinces of Assam, Bengal, Bihar, and Orissa. One would, perhaps, not be far wrong in saying that a practitioner in Calcutta comes across epidemic dropsy as frequently as malaria, if not more frequently. The city, according to Mazumdar (1933), recorded deaths from epidemic dropsy every year between 1905 and 1931. Widespread epidemics involving thousands of citizens and causing heavy mortality occasionally occur. The epidemics in 1909, 1926, and 1927 were particularly disastrous, when 433, 939 and 636 persons respectively are said to have died. Ten times this number must have been the victims of more or less permanent damage to the heart. The disease is not confined to the towns. Outbreaks occur even in the smallest villages, and at times large tracts of country in the eastern provinces of Assam, Bengal, Orissa, and Bihar become involved. Outside these provinces localized outbreaks have been reported from the eastern districts of United Provinces and parts of Madras Presidency. A few epidemics have occurred in Burma, Fiji, Mauritius, and certain other

parts of the world, but the disease has been practically confined to emigrants from those provinces.

#### EARLIER STUDIES

The history of the disease carries us as far back as reliable records are available. Chambers (1880) believed that the disease had been prevalent since the famine of 1866. Good descriptions of epidemics occurring in the last quarter of the nineteenth century and since then are given by O'Brien (1879), Caley (1878), Payne (1879), McConnell (1879), Crombie (1879), Deakin (1880), Kastagir (1880), McLeod (1893), Rogers (1902), Munro (1908), Cambell (1908), Greig (1911), and many others. How these epidemics arise, what factors favour their continuance and decline, how and why the disease prevalence is maintained at a low endemic level in certain localities, why certain communities suffer more than others, what determines the sex, age, and occupational distributions, what preventive measures can be taken, are some of the problems which have so far defied solution. In epidemic dropsy, as in many other diseases, bad weather, personal diathesis, water, inadequate or unsuitable food, unknown toxic substances, various types of organisms, and even insects have received their share of blame at the hands of various workers. Yet the lack of exact knowledge cannot be said to be due to want of interest on the part of the profession. Among others epidemic dropsy has engaged the serious attention of eminent workers like Rogers (1902), Lukis (1908), Greig (1912), Megaw (1927), Acton and Chóprra (1925), and many important contributions have been made. However, in the absence of exact knowledge every practitioner has perhaps either formulated his own theory or has adopted one advanced by others. We cannot do better than sum

up the present position in the words of the editor of the *Indian Medical Gazette* (1935) when he says: 'Many theories regarding the cause of the disease have been formulated, have lived their day and become history, and have been revived again.' However, from amongst a multitude of theories three have received considerable support. These are: (1) rice theory, (2) contagion theory and (3) mustard-oil theory. We propose to revive one of these theories and present fresh evidence in support of it, in the hope that it will stand critical examination and will not be cast away again into limbo.

#### OBSERVATIONS IN THE FIELD

These three theories formed our working hypotheses, and it was mainly on these premises that we proceeded to collect exact information in the field. Investigations were made in seven different localities where epidemic dropsy was raging. These included rural, semi-rural, and industrial areas in Bihar, Bengal, Assam, and Orissa, thus representing different living conditions. House-to-house visits were made and important data were collected on printed schedules specially designed for mechanical tabulation. In three localities data were collected for every individual and for each family, whether stricken or not. In other places investigations were confined to the affected families and to such unaffected families as were of special interest. Reasonable precautions were taken to ensure the veracity of the information recorded. Detailed information was obtained from 964 patients and 2,581 healthy persons, comprising 310 affected families and 290 unaffected families. In addition, certain relevant data were collected from 1,727 unaffected families having 9,678 members. The main points that emerged after critical analysis were:

- (a) Morbidity rate varies greatly from place to place.
- (b) The disease is almost exclusively confined to the Bengalees and to those who have adopted their way of living, especially in regard to food habits.
- (c) Both sexes are equally liable to suffer.
- (d) Epidemic dropsy claims its victims irrespective of their religious grouping, depending upon local circumstances.
- (e) Higher castes among the Hindus are the worst sufferers and the menial classes usually escape.
- (f) It is mainly a disease of the middle-class people.
- (g) Age distribution is very striking: suckling babies do not suffer, the disease rarely occurs in babies under three years of age, and the morbidity rate is very low up to five years. Above this age group there is not much difference.
- (h) Rice, as the principal article of diet of patients, can be excluded in rare instances only.
- (i) The habit of discarding water in which the rice is boiled does not afford any protection against the disease, as would be expected if it were due to a water-soluble toxin. On the other hand, more cases are found among those who reject rice-water than among those who do not. This is probably linked up with economic status.
- (j) Outbreaks of epidemic dropsy occur as frequently amongst people habitually using sun-dried and hand-pounded rice as among those taking parboiled and milled grains.
- (k) There is no evidence of bad storage of rice as one of the factors associated with incidence of the disease nor is there any clustering of cases around a common stock of rice.
- (l) The incidence of the disease and the consumption of rice grains having opacity are not found definitely associated.
- (m) Not a single case is observed among those who deny the use of mustard oil as an article of food.
- (n) Strong evidence has been obtained to associate a particular brand of mustard oil produced at a certain time with an outbreak of the disease at Jamshedpur.
- (p) Cases develop more frequently among those who give history of contact with patients, particularly

family contact, than among those who do not, but this factor is usually linked up with common messing.

(q) Congestion in houses is negatively correlated with the incidence of the disease (due regard having been paid to the population at risk). This factor is probably linked up with economic status.

#### EXAMINATION OF THEORIES

We may now examine the three theories stated above in the light of these observations.

1. *Rice theory*.—According to the rice theory in its present advanced form epidemic dropsy is caused by a water-soluble toxin which is ingested with rice. The toxin is elaborated inside the grain by certain members of the *B. vulgatus* group. Medium-grade rice, chiefly the variety locally known as 'balam', is the most suitable pabulum. Infection takes place most readily in parboiled and polished rice, in which the natural protective enzymes are destroyed. Storage under warm and damp conditions is favourable for infection. Infected grains may be readily differentiated from the healthy ones by the central opacity, which can be easily seen with the naked eye, especially if the grains are steeped in water or glycerin. This is at present the officially accepted theory.

It will be readily seen that the facts as presented above under items (e), (f), (g), (i), (k), and (l) are not in accord with the rice theory. Special attention in this connection may be drawn to item (i). Besides, we were unable to produce the central opacity in rice grains by storing the proper kind of rice under conditions which are believed to favour its development. Another objection to the rice theory is that, while rice forms the staple food in many parts of India and in other countries, the geographical distribution of epidemic dropsy is very restricted. Samples showing large proportions (more than 90 per cent) of typical centrally opaque grains were obtained from certain districts of Madras Presidency, where epidemic dropsy was unknown, and similar grains were also obtained from paddy gathered directly from the fields. Moreover, we were unable to demonstrate the presence of spore-bearing aerobes in the opaque part of the grain when surface sterilization had been efficiently carried out. The rice theory therefore failed to afford explanation of the observed facts. As we shall see later, direct experiments on human subjects also pointed towards the same conclusion.

2. *Contagion theory*.—It has been vaguely stated that the disease spreads from person to person by close personal contact. An influential section of the profession supports this theory. No definite views have been advanced with regard to the nature of the organism, the portal of discharge, the transmitting agent, or the portal of entry. Item (q) in the above summary threw doubt on the validity of this theory. It also fails to give adequate explanation of items (b), (e), (f), (g), and (m). It has been observed by many workers as also by us that introduction of patients in advanced stages of the disease into unaffected families is in many instances not followed by the development of secondary cases, even though conditions are very favourable for transmission of disease from person to person through droplets or contact. To test further the validity of this theory an experiment was conducted in a semi-isolated community.

Forty-six young men lived in a barrack side by side and worked by shifts as warders in a local jail. According to messing arrangements they were divided into five unequal groups. In one of these groups five out of seven went down with epidemic dropsy within a week. The servant who cooked for them was also a victim. Members of this group, as also of the other groups, occupied beds next to one another. This arrangement was altered so that the patients now occupied seats in between the healthy persons. The experiment continued for about four weeks, but no fresh cases developed.

It would thus appear that common food rather than personal contact was the factor responsible for the incidence of cases in this community. As it happened

the affected group was the only one which purchased mustard oil from the bazaar. All the other warders obtained their supply from the jail.

3. *Mustard-oil theory.*—This also is ill defined inasmuch as no definite views have been advanced with regard to the nature or the source of the substance in the oil which causes the symptoms. The theory is popular among the lay people, in whom malice against the Marwaris (who sell mustard oil but do not themselves take it) plays an important part, because they never contract the disease. Adulteration with cheaper grades of oil, or even with mineral oil, is suspected. This theory has very few adherents amongst responsible members of the profession.

There is a striking correspondence between the endemic area and the part of the country in which mustard oil is habitually used by the bulk of the population. This fact is highly suggestive. Further, even in this area the disease is, in our experience, strictly confined to the communities that are consumers of mustard oil; a minority of the population, mostly emigrants from other provinces, who use *ghee* (clarified butter) for cooking purposes, escape. Indeed all the facts enumerated in the summary given above fit in with the hypothesis that certain consignments of mustard oil are responsible for the causation of the disease. In this connection the epidemic which occurred in October 1936 at Jamshedpur is of special interest. Being a purely industrial town its population, which totals about 100,000, is very cosmopolitan. Jamshedpur had been free from epidemic dropsy for some years when, in October 1936, the first case occurred. Within five weeks 222 cases were reported, involving sixty-six families. Of these fifty-two were Bengalee families living on the usual Bengalee diet. The non-Bengalee victims were also found to have taken to Bengalee diet; at any rate rice and mustard oil were used by them in considerable quantities. The most remarkable feature of this epidemic was that the affected families had a common source of mustard oil supply. Eighteen of them obtained one particular brand of oil direct from the mill, of whom fourteen received it in original sealed containers and four loose, and thirty-five obtained it from the grocers. In ten instances the grocers stored this brand, but the customers had not specially asked for it. In the case of three families the evidence was not so clear. There were no cases among the large clientele of the other three mills which supplied mustard oil to the town. Another important point is that the cases only appeared amongst people who had purchased the oil during October and the first week of November. The suspected brand of oil had been quite popular for some time, and nothing untoward had happened previously. Thus the suggestion is that a particular consignment of oil of this brand was associated with the epidemic. It may be mentioned here that the manufacturers claimed that the oil was unadulterated and of good quality. The genuineness of the oil was confirmed by chemical analysis, kindly carried out for us by the Professor of Public Health Laboratory Practice on a sample collected from one of the affected families.

Thus we see that the field studies, laboratory investigations, and observations under controlled conditions so far described threw doubt on the validity of the 'rice' and the 'contagion' theories. They gave, however, a definite lead in favour of the mustard-oil hypothesis stated above. Since we were able to procure samples of oil in original containers from the affected families it was now possible to test this hypothesis by feeding human volunteers on the suspected oil under strictly controlled conditions.

#### FEEDING EXPERIMENTS ON HUMAN VOLUNTEERS

The results of these experiments are very striking. It is not proposed to go into the details of the experiments, but a few interesting facts are stated below.

Three experiments were performed, in each of which twelve healthy young subjects who were willing to take the risk and who were ready to give an undertaking that they would continue on the special diet for the required period, were selected. In the first two experiments the

subjects were divided into four groups of three each, and the experiments were arranged as below:

Group A: 'diseased' rice and 'suspected' mustard oil.  
Group B: 'diseased' rice and jail-produced mustard oil.

Group C: clear rice and 'suspected' mustard oil.

Group D: clear rice and jail-produced mustard oil.

The main difference in the two experiments was the source from which the 'suspected' oil was obtained. The oil used in Experiment I was collected from an affected family in Assam, while that used in Experiment II was obtained from an affected family at Jamshedpur. No untoward symptoms developed in any volunteer in the first experiment, except in one of those taking suspected oil. He complained of loss of appetite and constipation. Later he developed a cold with slight rise of temperature, but was restored to normal condition after a few days of rest and milk diet. In the second experiment, on the fifth day after the commencement of the special diet, two persons in group A and one in group C missed their morning meal and all members of groups A and C complained of pain in the joints and of symptoms of gastro-intestinal disturbance. Later some of them developed fever and three developed oedema of the legs with flush and pitting on pressure, which are characteristic of epidemic dropsy. Two of the oedema cases belonged to group A and one to group C. The last-mentioned patient was taken out of consideration, because on closer examination he showed evidence of chronic filariasis. All the controls remained perfectly healthy and cheerful. That was the first occasion on which it had been possible to reproduce signs and symptoms of epidemic dropsy in human subjects. The value of these results is further enhanced on account of the history behind the suspected oil which was employed in this experiment.

However, it remained undecided whether oil alone could produce the condition or if it was necessary to combine 'diseased' rice with it. A third experiment was therefore carried out in which 'diseased' rice was excluded. The source of suspected mustard oil was the same as in the last experiment. The results of this experiment were very striking. After the same premonitory symptoms which were observed in groups A and C of experiment II well-marked oedema of the legs developed in all the subjects taking the suspected oil. In three cases there was dilatation of the heart. In one patient foetal type of rhythm and in another systolic bruit were heard; there were no symptoms referable to the nervous system. In short, in the judgment of competent physicians the signs and symptoms in these cases were identical with those found in mild cases of epidemic dropsy. The controls remained perfectly healthy.

#### DISCUSSION

In the absence of exact knowledge of the causal agent epidemic dropsy can only be defined as a clinical entity. Descriptions of different observers vary to a certain extent. It is, therefore, possible that this condition, like so many other diseases, such as croup and the enteric fevers, may in course of time be split up into two or more distinct diseases on the basis of their ætiology, which may possibly be entirely different for these really distinct but allied clinical entities. The clinical feature on which we have mainly relied for distinguishing the condition which we have called epidemic dropsy from what has been described as 'wet beri-beri' is the entire absence of signs of involvement of the nervous system. In this respect and in general symptomatology the cases met with in the course of field investigations and those developed under experimental conditions were exactly alike. At any rate the present position may, we think, be stated in the following words:—

The clinical condition known as epidemic dropsy (or beri-beri by lay people), as commonly met with in endemic or epidemic form in Assam and Bengal and in parts of Bihar and Orissa and occasionally outside these boundaries, mostly among emigrants from these provinces, is caused by some unknown substance or substances which enter the system through the ingestion

of food cooked in certain consignments of mustard oil. The oil may be genuine and unadulterated. The nature of the poisonous substance is not known. There is some evidence in favour of the view that the deleterious substance is not a normal constituent of mustard oil and that it is more likely to be a chemical poison rather than something in the nature of a living virus. However, inquiries are in progress to clarify this point and to develop, if possible, a test by which bad oil may be distinguished from the harmless one.

While the problem of the etiology of epidemic dropsy cannot be said to have been completely solved, a definite advance has been made and a stage has been reached when preventive measures, based on scientifically proved facts, can be recommended, though their application is limited to a certain extent by the absence of knowledge about the nature and origin of the deleterious substance in the mustard oil. It should now be the duty of the health administrator to trace the oil which has caused the disease to its source as soon as he comes across cases of epidemic dropsy, and to prevent its further distribution. He should also prohibit its use for cooking purposes. The discarded oil may be used for oil baths, as it is probably harmless when applied externally. Besides, there are many other uses to which this oil can be put. The length of the incubation period or the lag phase—five days for premonitory symptoms and nine to twenty-three days for development of oedema, as noticed in our human experiments—should be of assistance in tracing the bad oil. By adopting the measures recommended above it should be possible to prevent the spread of the disease among those who have not yet partaken of the oil and to reduce the severity of the disease in those who have taken it in just sufficient quantities to cause premonitory symptoms.

#### SUMMARY

1. A brief statement is given of the results of epidemiological studies in connection with outbreaks of epidemic dropsy in seven localities in Bihar, Bengal, Assam, and Orissa, representing rural, semi-rural, urban, and industrial conditions.

2. An epidemiological experiment designed to test the contagiousness of the disease in a semi-isolated community is briefly described.

3. Three principal theories of the etiology of the disease are discussed, and it is shown that the observed facts fail to support the 'diseased-rice' theory and the 'contagion' theory. A very satisfactory explanation of these facts is provided by the hypothesis that epidemic dropsy, as commonly seen in these provinces, is caused by a deleterious substance contained in certain consignments of mustard oil.

4. Experiments on human subjects, living under strictly controlled conditions, are described. They show that signs and symptoms of epidemic dropsy are produced in healthy young men by giving them food cooked in a brand of mustard oil which is strongly suspected, on epidemiological grounds, of being responsible for an epidemic—the 'diseased' rice having been altogether excluded from the experimental food.

5. Practical application of these findings is discussed.

### The Choice of Bismuth or Mercury with Arspenamine

(In the Treatment of Early Syphilis)

By A. B. CANNON, M.D.

and

J. ROBERTSON, M.D.

(Abstracted from the *Journal of the American Medical Association*, Vol. CVI, 20th June, 1936, p. 2133)

AFTER a quarter century of experience with the arspenamines, there are still schisms in the ranks of experts over many vital phases of their use in the treatment of syphilis. It is not surprising, then, that the status of bismuth—in use as an antisyphilitic only a little over a decade—should not have achieved the

fixity of the Decalogue. The physician who declines to depend on the drug salesman for his choice, and who attempts instead to sift the testimony of experienced users of bismuth, will find these divided, like Cæsar's Gaul, in partes tres: one, led by the French, who see in bismuth a sort of miracle drug, destined to replace the arspenamines because equally efficacious but less toxic; a second, who believe that bismuth cannot replace the arspenamines but that as an adjuvant it has certain advantages over mercury, for which it may be substituted either entirely or in part, and a third who evidently feel about bismuth much as a famous Viennese doctor did about mercury when he pronounced it 'a crime against the human race'.

The stand of the 'Bismuth über alles' exponents is already weakened by the generally admitted increase in the incidence of syphilis in France, where bismuth was almost universally substituted for the arspenamines during the decade following its introduction in 1921. It was noticeable at the Réunion dermatologique in Strasbourg in June 1930 that even the French speakers differed among themselves in regard to the actual accomplishments of bismuth, several eminent syphilologists challenging the optimistic reports from the Fournier clinic and advocating that an arspenamine be alternated with bismuth, at least in early syphilis. Those of the opposite extreme, who would ban bismuth at any price, seem to consist mostly of those who, like the French, embraced the new drug with initial enthusiasm as better than arspenamine and, having found its action considerably short of miraculous, will henceforth have none of it.

Together with the majority of American syphilologists, we take the middle ground: we would by all means make arspenamine bear the brunt of the attack in early syphilis and use mercury or bismuth as an adjunct. On the question of bismuth versus mercury, however, we have found the literature largely a literature of impressions, with surprisingly few systematic comparisons of the two. It was in an effort to determine at first hand the relative efficacy of the two drugs in the treatment of early syphilis that we decided to study the results achieved with various preparations of each, on groups of hitherto untreated syphilitic patients at the Vanderbilt Clinic. A few patients attending City Hospital also were included in the study.

#### PROCEDURE

A certain number of patients admitted with primary or early secondary syphilis were placed immediately on bismuth or mercury preparations for a limited trial period, so that we might observe their response to these drugs, uncomplicated by the arspenamine factor. During this time the patients' general improvement, the healing of surface lesions and the disappearance of *Spirochaeta pallida* from the lesions were recorded. All these patients were placed on the standard arspenamine-bismuth or arspenamine-mercury treatment as soon as their surface lesions had healed. We also followed the results obtained with patients treated on the standard arspenamine-bismuth or arspenamine-mercury plan from the beginning. This combined treatment in both groups of patients was then further evaluated on the basis of (1) the reversal of the Wassermann reaction, (2) the number and type of relapses, (3) the patient's tolerance of the drug, and (4) his clinical and serologic behavior after completing the prescribed treatment.

The standard treatment plan to which we attempt to hold every clinic patient admitted with early syphilis calls for a total of three courses, of ten injections each, of an arspenamine and three courses of fifteen injections each of a mercury or bismuth preparation throughout the first year. During the first month the arspenamine and mercury or bismuth courses run concurrently; thereafter they alternate or overlap, so that the patient is continuously under treatment with one or the other, or both. The first six injections of arspenamine may be given twice weekly and the following four at weekly intervals, or they may be given as often as every other day for six injections and



the following four at three, four, five and six days intervals to complete the first course. The second and subsequent courses of arsphenamine are given twice weekly for the first six injections and weekly for the following four. The interval between the first and second courses of arsphenamine should be four weeks, between subsequent courses six weeks.

The first course of fifteen injections of mercury or bismuth is given at four or five days intervals for the first six injections and weekly for the following injections of the course. Both intravenous and intramuscular injections may be given at the same visit, for the convenience of the patient, except that during the first two weeks the patient receives from four to six injections of arsphenamine and only three of mercury or bismuth. Between arsphenamine courses, and while the patient is receiving only mercury or bismuth, he is also given potassium iodide by mouth.

If at the end of the first year the blood Wassermann and spinal fluid reactions are negative and there has been neither serologic nor clinical relapse, the patient is permitted to stop treatment and remain under observation, returning at intervals of three months for blood tests during the second year, and at longer intervals thereafter.

This regimen could not always be followed. The Vanderbilt Clinic is not a free clinic and this department has no Saturday or evening hours, so that many employed patients in the lower income brackets find it difficult or impossible to attend more than once a week over any considerable length of time. A number of cases included in the original investigation were excluded from the final analysis because of irregular attendance or other accidental factors which might have interfered with a fair appraisal of the drugs used. Those included may be understood to be patients with syphilis whose infection was of not more than six months' duration at the time they began treatment and who attended with fair regularity. The study comprises 379 cases in all.

#### CHOICE OF BISMUTH PREPARATIONS

The mechanism of action of bismuth compounds in the organism is not yet understood, but it seems to depend chiefly on the amount of bismuth metal that can be introduced without toxic effects. At least no differences in the therapeutic efficacy of bismuth compounds have been noted that cannot be accounted for by the ease with which the bismuth metal is split off and taken up by the organism. Of salts in aqueous solution, only one-fourth or one-fifth as much can be injected at a time, as of compounds suspended in oil. And of the amount injected, it appears to be that fraction in active circulation which is therapeutically effective. But this circulating bismuth is for the most part on its way out of the system by way of urine and faeces, a small part probably being held back in various organs and released later. Since the compounds in aqueous solution—because of both the smaller individual dose and the aqueous medium—are absorbed and eliminated very rapidly, injections must be given at intervals of one or two days in order to maintain an adequate concentration of the metal in the blood stream. This drawback is increased by the fact that injections of the salts in aqueous solution are usually painful. On the other hand, bismuth compounds suspended in oil, besides being well tolerated in larger amounts, are absorbed much more slowly and eliminated only gradually, so that even with one injection weekly a fair amount of the bismuth metal remains in circulation. Bismuth in oily solution, introduced more recently, is considered to combine many of the advantages of both the foregoing groups with a minimum of their disadvantages. Its action begins more promptly than that of the oily suspensions. It is absorbed more slowly than the soluble salts and therefore remains in circulation longer than these, but its release is not so slow as to risk accumulating toxic residues at the site of injection. Like the oily suspensions, bismuth in oily solution is relatively painless on injection and is even less apt to

form sterile abscesses later on. It was with these considerations in mind that the following preparations of bismuth were selected for use in the overwhelming majority of cases in the Vanderbilt Clinic:

*Sodium potassium bismuth tartrate.*—This is the suspension in olive and almond oils, with butyn, each cubic centimetre containing 50 mg. of metallic bismuth. Of the various bismuth preparations investigated by Cole and his co-workers, the oily suspension of the water-soluble tartrate gave evidence of being absorbed more rapidly than the oily suspension of the insoluble bismuth salicylate but more slowly than the various watery or oily solutions tested, so that one injection a week is sufficient to maintain an active fraction in circulation. The injections are relatively painless, and Raiziss found this to be one of the least toxic of various bismuth preparations tested. The individual dose is usually 1 c.c. (50 mg. of metallic bismuth) at the beginning and is increased to 2 c.c. after the first few injections, making a total of about 1,350 mg. of bismuth metal in a course of fifteen injections.

*Bismo-Cymol (N. N. R.).*—This is the basic bismuth camphocarboxylate in solution in olive oil, each cubic centimetre containing 50 mg. of metallic bismuth. Its toxicity, investigated by Kolmer, both in animal experiments and in clinical trials, was found to be very low, the maximum tolerated dose being fifteen times the amount of the therapeutically active dose. Raiziss also found this preparation to be less toxic than other oil-soluble preparations of bismuth. The initial dose of 1 c.c., representing 50 mg. of metallic bismuth, is increased after a few injections to 2 c.c., giving the patient a total of about 1,350 mg. of bismuth metal per course, as in the case of the tartrate.

A few patients in City Hospital who were treated with biliposol (N. N. R.) and a few Vanderbilt Clinic patients who received potassium bismuth tartrate (N. N. R.) were also considered eligible for inclusion in the present study. The same dosage scheme was followed for these preparations as for those already discussed (from 1 to 2 c.c. weekly). Biliposol, an oil-soluble preparation containing 40 mg. of elemental bismuth in 1 c.c., would provide about 1,080 mg. of bismuth per course of fifteen injections. The excessive cost of this otherwise satisfactory preparation has interfered with its wider trial in the two clinics. The potassium bismuth tartrate in suspension in almond oil contains 33.5 mg. of elemental bismuth in 1 c.c. and would supply a total of from 900 to 1,000 mg. of bismuth per course. This preparation was replaced by the sodium potassium bismuth tartrate largely on account of the higher bismuth content of the latter product. Any patient who had difficulty in tolerating injections of the oil-suspended salts could usually tolerate the oil-soluble bismo-cymol.

#### CHOICE OF MERCURY PREPARATIONS

The same general considerations that have been set forth briefly with regard to bismuth apply also to the choice of mercury preparations, except that the metal content of the various mercurials is subordinate to factors making for tolerance, because of the narrower margin of safety between the therapeutic and toxic doses.

Mercuric salicylate, given in the great majority of cases in the present study, has been used so widely and over so long a period that it would be superfluous to review its claims here were it not for the recent tendency of some syphilologists to demote it in favour of the water-soluble succinimide. Mercuric salicylate, or, more accurately, the basic mercuric anhydride of salicylic acid, contains about 55 per cent of metallic mercury and is relatively painless when injected intramuscularly in a suspension of a vegetable oil. Absorption begins promptly, as shown by comparatively high excretion curves within twenty-four hours after injection, but excretion continues more slowly for a considerable period after the end of a course, thus providing an advantage over the soluble mercurials similar to that of the insoluble salts of bismuth. Weekly injections, beginning with one-half grain

(0.03 gm.) and increasing to 1 grain (0.065 gm.), keeps a fair amount of the metal in circulation, as evidenced by excretion, and if courses are alternated either with an arsphenamine or a bismuth preparation, toxic symptoms are relatively infrequent.

Mercuric succinimide (N. N. R.), the mercuric salt of succinic acidimide, containing approximately 50 per cent of mercury, has proved a worthy addition to the list of soluble mercurials. Like other soluble preparations, it is painful on injection and is absorbed so rapidly that daily injections are needed in order to maintain an adequate concentration in the blood stream. These drawbacks render it impracticable for routine clinic use, but it is valuable in cases in which prompt action is important and the arsphenamines are contraindicated. For patients included in this study, the standard dose was one-fourth grain (0.016 gm.) given daily or on alternate days.

#### BISMUTH AND MERCURY AS SPIROCHETICIDES

It is doubtful whether either mercury or bismuth exerts direct spirocheticidal action in the system. *In vitro*, bismuth does not kill *Spirochaeta pallida* even when mixed with serum, but with extracts of certain organs, especially liver, it forms a compound known theoretically as 'bismoxy', which is spirocheticidal. Kolle's experiments indicate that bismuth inhibits the growth of the parasite without destroying it. As for mercury, Lomholt has shown that *Spirochaeta pallida* could grow in a concentration of mercury in the blood serum more than twice as great as that prevailing in the blood of a patient at the saturation point, or limit of tolerance at which toxic symptoms appear. These and other facts suggest that whatever spirocheticidal action is exerted by mercury, and to a certain extent that exerted by bismuth, is indirect, by stimulating the tissues to a stronger defence reaction. Since for a direct attack on *Spirochaeta pallida* we depend primarily on the arsphenamines, the performance of the heavy metals in this respect is of secondary importance.

#### SUMMARY AND CONCLUSIONS

On the basis of our observations as a whole, neither bismuth nor mercury appears to have such a decided advantage over the other as much strongly partisan testimony would lead one to believe. While in our comparative studies of the arsphenamines, arsphenamine proved to be almost uniformly superior to neoarsphenamine, and silver arsphenamine, by every criterion applied, no such clear-cut superiority could be discerned in the performance of either of the heavy metals. Spirochetes disappeared from primary lesions and the lesions themselves healed more promptly under bismuth than under mercury, but a positive Wassermann reaction reversed earlier under mercury in the primary stage; in fact, one primary patient achieved a negative Wassermann reaction in twenty-three days under mercuric salicylate alone (five injections) while his chancre was still unhealed and spirochetes were still present in the chancre fluid. In secondary syphilis, however, the situation was reversed: mercury gave slightly better results than bismuth in the healing of eruptions, condylomas and mucous patches, but mercury-treated cases were considerably slower in becoming Wassermann negative (they were at a disadvantage, however, in that the patients received preponderantly neoarsphenamine for their arsphenamine). Again, there were more than twice as many patients serologically resistant to mercury as to bismuth, but more relapses occurred under bismuth.

Among patients with early syphilis who completed the required first year of regular treatment, there was a larger proportion of satisfactory outcomes in the mercury group than in the bismuth group. The only clinical relapse occurred in a patient treated with bismo-cymol and silver arsphenamine, but the total number of injections received was below the optimum recommended. The only patient who showed a positive spinal fluid after completing a year of regular treatment received mercuric salicylate, silver arsphenamine and arsphenamine in but half the recommended dosage.

In the matter of complications that could be definitely attributed to the heavy metals alone, bismuth was responsible for only half as many as mercury; while of delayed systemic reactions such as dermatitis, jaundice and neuritis, in which both the arsphenamine and the heavy metal may be presumed to have had a part, the mercury group contributed only a little more than half as many cases as the bismuth group.

Thus the differences are not easily weighed and measured, and such differences as appear when the intramuscular injections are given alone, or preceding the first arsphenamine course, tend to become obliterated when an active arsphenamine preparation accompanies the heavy metal from the start. The facts uncovered in the present study suggest that:

1. The salts of both metals have an important place in the antisyphilitic armamentarium. The various preparations selected—both of bismuth and of mercury—appear to have justified themselves in all cases examined in which the treatment was regular and the dosage adequate; but neither metal can compensate for the disadvantage of using an inferior arsphenamine preparation.

2. Mercury gives more brilliant but less uniform results than bismuth, so that in robust patients with a healthy excretory mechanism the body's natural defences are perhaps more effectively stimulated by the mercurials. For patients less vigorous and for those who do not respond well to mercury preparations, bismuth offers a valuable substitute.

3. Arsphenamine can be counted on to deliver the strongest initial attack against *Spirochaeta pallida* and acts to best advantage when reinforced by one of the heavy metals; but if for any reason an arsphenamine is contraindicated, bismuth will probably give the better performance alone.

4. For those who would minimize the chances of ill effects and for those who hold that the parasite may become drug fast, alternating the two metals offers an obvious advantage.

### Ocular Hypertension in Glaucoma (Errors in Operative Technique likely to cause Failures in Operations for its Control)

By W. W. WEEKS, M.D.

(From the *Journal of the American Medical Association*, Vol. CVII, 5th September, 1936, p. 774)

SINCE the operative procedures to be discussed for the reduction of increased intra-ocular tension have to do directly with the anterior segment of the eyeball, it seems advisable to consider only this portion of the eye.

It is assumed that the cases judged operable have been thoroughly worked up, with the elimination of all conditions likely to interfere with or subsequently nullify the possible success of an operation. Constitutional, metabolic, nutritional states, tissue change due to age, and focal infections all have to be determined and weighed as to their influence on tissue repair, hemorrhage or infection. As Colonel Elliot puts it: 'Eliminate all sources of endogenous sepsis; observe scrupulous sepsis'. The latter point was strongly emphasized by Clifford Walker last year. He showed that even small particles of foreign matter in a trephine tip were the source of irritation, congestion and infection. The judgment, skill and care in carrying out operative procedures should further be safeguarded by keeping the patient quiet, using hypnotics or even a general anæsthetic. The Van Lint lid block, a thoroughgoing local anæsthesia and a retrobulbar anæsthesia by way of the capsule of Tenon or by a ciliary ganglion block, should be used.

The type of operation to be done is based on the estimated change in tissues and any alteration in the position of the parts involved in any eye with hypertension, and carried out only after proper measures—local and systemic—have been thoroughly tried and have failed. The consensus is that medical measures



are apt to be carried on too long, permanent damage occurring, or that the patient has waited too long before seeking advice and operation. Should the tension be too high to operate safely, an anterior or posterior sclerotomy may be necessary to reduce tension and deepen the anterior chamber.

Light, dextrous, deliberate, clean-cut operative methods with the least amount of trauma to the tissues always secure the best results. Rough handling or bruising of tissues, so that a congestive irritation is set up, delays healing and encourages infective processes.

Magitot says: All operations, iridectomy, cyclodialysis, sclerecto-iridectomy may have good or bad results. This does not depend upon the technic but upon the nature of the local condition, the vascular disorder.... The glaucoma is a symptom, the hypertension a disease.

The classification of the types of glaucoma and the operative procedures most commonly used as suggested by Gradle will be followed.

The therapeutic iridectomy is aimed at the re-establishment of the normal pathways for the drainage of intra-ocular fluids. Its object is to make a limbic incision, to excise a portion of the iris, to free the filtration angle before anterior peripheral synechias have solidly formed, to open a free passage between anterior and posterior chambers and to revive the equilibrium of inflow and outflow of ocular fluids by way of the iris circulation and filtration angle.

*The incision.*—In the words of von Graefe: (a) it should be as eccentric as possible in order to remove the iris as far as its ciliary attachment (this is essential to success); (b) the aqueous should be allowed to escape slowly.

The usual tendency in making a keratome incision, especially if the anterior chamber is shallow, is to make the incision too far forward in the cornea in attempts to avoid the iris; or, if all allowance is not made for the corneal curve or the position of the eye when the patient looks down, the incision is made too obliquely, producing a corneal shelf posteriorly, as shown in post-operative microscopic sections. In either event, the iris cannot be removed up to its root; a portion is left to adhere in the filtration angle.

If the incision is made with a keratome, its insertion and withdrawal should be deliberate, on a plane with the iris. If the handle is too far forward the tip will catch the iris, dragging the iris away from its root, causing pain and hemorrhage; should the forward movement be persisted in, the operator endeavouring to make his incision wide enough, the zonula and lens may be injured. In withdrawing the keratome is when most errors are committed: the handle is carried far forward, allowing the tip to scrape along the anterior capsule of the lens and the iris is forced backward, causing undue pressure on the zonula at the same time that the wound gapes, permitting an expulsive loss of aqueous. A knife incision when the anterior chamber is shallow is safer, although even here care in cutting out slowly should be observed. In these cases an iridectomy *ab externo* is an excellent procedure.

The width of the incision, too, should be enough to allow easy instrumentation for the iridectomy and not large enough to encourage too rapid a loss of aqueous or a large prolapse of iris or even the ciliary body.

*The iridectomy.*—Von Graefe thought that 'a large portion of the iris should be excised, the more intense the symptoms the more extensive the excision'. In the cases considered for this operation to-day in the early stage, one is apt not to follow this dictum; removal of the iris at its root, establishing a free communication between the anterior and the posterior chambers, and the re-establishment of circulatory equilibrium make it unnecessary to form a large coloboma, which gives a most annoying dazzling from too much light entering the eye. The iris forceps should be slid over the posterior lip of the wound, closed and opened only 2 mm. over the sphincter of the iris, which it grasps lightly. Attempts at entering the wound with conjunctiva, of the anterior lip over the tip of the

forceps, or attempts to grasp the iris by tipping the forceps strongly backward may produce a dialysis of the iris, break the zonula or dislocate the lens. The iris should be drawn out slowly, until just taut; cut through the sphincter on one side, and then gently torn from its base from 3 to 4 mm. and again cut. Continued dragging upward may tear the iris entirely out or leave the iris pillars firmly incarcerated in the angles of the wound.

*Toilet of the wound.*—The iris pillars should be stroked easily or floated by saline solution into position, from periphery toward the pupil, no pressure being used. The conjunctiva should be placed in position and sutured if necessary, so as not to allow it to slide down and buckle into the wound, a deep vascularization taking place from this faulty position of the conjunctiva.

Some surgeons believe that atropine instilled after an iridectomy is superfluous and wait for iritic signs and symptoms to arise before so doing. It is essential to make this instillation of atropine a routine, unless for any reason, as in peripheral iridectomies, for forty-eight hours the pupil is to be drawn down with miotics for the purpose of keeping the iris out of the wound. A traumatized iris is bound to react by slowing up of the blood stream, the contents of the blood vessel being exuded into the area, blocking the filtration angle, or leading to an infection, unless studied with a slit lamp under magnification and measures adopted accordingly. This is not appreciated until irreparable damage has been done or at least started, the stimulation of cellular proliferation going on to wound repair.

The Lagrange sclerecto-iridectomy is an operation, as is the Elliot trephining and the Holth iridencleisis procedure, to establish extra-ocular pathways for the drainage of intra-ocular fluids. The object of this operation is an excision of a portion of sclera in the filtration angle under a conjunctival flap, sectioning the scleral spur, opening up the suprachoroidal space, and excision or not of a portion of the iris.

In the original operation, when a knife incision is used with a removal of the scleral segment by scissors or knife (Kalt) cut or Vacher punch, the least amount of trauma to parts involved is done and the sclerectomy covering is usually adequate. This too can be said of the modified operations with the keratome, although here the incision into the anterior chamber is further forward, not sectioning the scleral spur.

The errors in technic with the incision occur in making the incision too far back, so that the ciliary body is injured, in making the sclerectomy too wide and too long (as when first advised it was 7 by 1 mm.). The ciliary body and processes bulge forward into the wound. Should the sclerectomy be too narrow, much less than a millimeter in width, it closes over from episcleral connective tissue growth surely and rapidly.

This operation offers a nicety of judgment and skill to be demonstrated only by a surgeon accustomed to doing it.

The iridectomy, whether complete or peripheral, should be such as not to leave the iris incarcerated in the wound. Lagrange and Holth insisted on this, although later Holth found that iris incarcerations were of aid in forming a filtering cicatrix. He later devised and continues to carry out the iridencleisis procedure. It might be said here that the iridodialysis done by Spratt can be done in these cases, especially when an active iris can be controlled with miotics long enough to have the aqueous go directly through from the posterior chamber into the peripheral anterior chamber and into the fistulous opening. When this does not occur, the iris persisting to prolapse, or when the iris is atrophic, the root of the iris should be excised, leaving the iris sphincter intact for whatever miotic action is necessary, avoiding the disturbing coloboma.

Lagrange always insisted on early massage in these cases, keeping the tension between 12 and 25 (Schlötz) if possible. As with the trephine, if the sclerectomy is too large, hypotony with its ensuing degenerative changes may follow.

The toilet of the wound is done with the same care as in the therapeutic iridectomies with a suturing of the conjunctiva and the instillation of atropine. One is reminded that careful observation of the reaction of the iris to injury subsides in a few days, when the atropine can be discontinued. When continued longer it may act as an irritant, defeating the object of its instillation.

The trephine operation in this country and in many European eye clinics is the operation most used for filtering purposes, for chronic uncompensated (late stages), compensated hypertensive cases and infantile types of glaucoma. The first fault likely in carrying out this operative procedure is in making the conjunctival flap.

Colonel Elliot says:

1. Fashion a wide-based conjunctival flap, avoid injury of the subjacent tissues as much as possible whilst raising it.

2. Carry the dissection as low as possible.

The trauma involved in securing this conjunctival flap, perhaps not too large, if not done lightly and speedily with avoidance of pressure on the globe, may cause a delay in the formation of the anterior chamber. This, too, may follow a buttonholing of the flap.

Colonel Elliot makes a strong point of splitting the cornea, not cutting it, and Calhoun believes that this should be properly done to ensure the placement of the trephine well on the cornea.

If the conjunctiva with subconjunctival tissue and episcleral tissue is dissected well on to cornea to the limit seen in the microscopic sections—done cleanly, leaving no episcleral tissue to allow the trephine to slip about—it would seem that splitting the cornea is an added trauma, with additional raw edges and subsequent irritation.

In the aged, little subconjunctival tissue is present; it is essential that episcleral tissue from the insertion of the superior rectus muscle should be taken down with the conjunctiva to avoid a thin conjunctiva over the trephine opening, avoiding a fistula or subsequent infection, should a virulent conjunctivitis supervene at any time. Case reports show that this may happen, and yet several writers have traced this possibility to an iris strand in the wound, keeping up a local irritation, or a quiet iritis which leads on to an infection.

Complications are believed to follow the use of too large a trephine—2 mm.—too free drainage followed by hypotony. Colonel Elliot uses nothing else and has had no bad results or regrets from using this size trephine. My experience with the 2 mm. trephines was that the conjunctival flap seemed to lie flat on the opening and even be drawn into it from the hypotony that ensued, forming an excellent bridge for newly formed connective tissue to grow under it. Ciliary body, ciliary processes, vitreous and even lens have been seen in these wounds. The usual size trephine is 1.5 mm., which, unless sharp, requires much effort to make an opening; when the latter is made, it is ragged and often incomplete and leads to early wound closure from connective tissue formation. No scleral hinging is advised for this reason. A suture may be placed in the segment to be excised with the ends run through the hollow trephine shaft. The trephine advised and used by Walker is good for this purpose. The corneo-scleral disk if lost need not worry the operator, and usually the escape of aqueous and bulging of the iris into the wound keep the disk out of the anterior chamber, especially if the trephine just cutting through the corneosclera is gently and slowly removed.

The site of the trephine opening by its author is half cornea and half sclera. Some writers believe that it should be well forward in the cornea, but most surgeons believe that cornea tissue proliferates easily, closing the opening. Others believe that this occurs if the opening is scleral in position.

A number of men lay the failure of a trephine opening to remain open permanently to the fact that the corneo-scleral disk has not been removed cleanly. Sections of the disk should be completely lined or at

least partly lined by Descemet's membrane. Uninfected wounds of the corneoscleral region, when bathed by aqueous humor, manifest no tendency to the development of granulation tissue and remain open indefinitely.

The complications of iridectomy are the same as those mentioned in the two previous operations; perhaps more so, as the area of operation is limited.

Errors are committed in simply cutting off the top of the iris as it is bulging into the wound, leaving the root of the iris to swing into the wound later; in not cutting away enough iris, so that when replaced it is not well away from the wound margins; in reaching for an iris which does not prolapse readily or at all. It is in the latter attempts that the zonula is broken and vitreous presents.

In the replacement of the iris, gentle massage on the cornea or a stream of physiologic solution of sodium chloride may float it into place. All writers condemn the use of the spatula in the trephine opening as a source of injury to the lens and zonula.

Suturing the conjunctival wound, instillation of atropine when the iris has been traumatized and the use of massage in certain cases in which filtration is slowed up temporarily by a blood clot or iritic exudate are strongly advised. With the restoration of the anterior chamber and more or less normal ocular fluid, failure of drainage through the opening, and closure of this fistula, or absorption by way of the conjunctival and episcleral vessels are unlikely.

*Iridencleisis.*—This method of extra-ocular drainage, popularized by Holth, is becoming more used in this country for the same type of cases for which the Lagrange and trephine operations are done. In the secondary types following cataract operation it has seemed to be of help.

The same steps as in therapeutic iridectomy are carried out with the modification of Holth, using a punch excision of a millimetre strip of sclera in the filtration angle. The first cut in the iris is as mentioned, cutting the iris meridionally through the sphincter, with the resultant temporal or nasal portion of the iris placed under the conjunctiva as a tube or flattened out, exposing the epithelial layer under the conjunctiva. This represents an interposition of material between the cut ends of Descemet's membrane, over which the corneal endothelium does not grow. When the iris has become atrophic with loss of much of the pigment, filtration seems to stop with the formation of connective tissue from both the iris and the surrounding episcleral tissue.

Spaeth has shown that the lining of the filtration scar is made up of iris epithelium. Verhoeff earlier thought that the iris tissue atrophied and became stretched and cracked in areas, allowing the aqueous to flow into the separated fine connective strands making up the rest of the cicatrix.

Hæmorrhage into the anterior chamber is often prevented, Gjessing believes, if a retrobulbar anæsthesia with epinephrine is used. He has also said that 'iridencleisis offers no more lasting good result than other operations for glaucoma'.

Infection through the filtration area as well as sympathetic ophthalmitis has been reported.

*Cyclodialysis.*—This is Heine's operation for the intra-ocular drainage of the aqueous. Instead of a keratome, the sclera is usually incised with a knife underneath a conjunctival flap 4 to 5 mm. from the limbus. The ciliary body may be cut into, causing profuse hæmorrhage. The separation of the ciliary body from the sclera, by breaking through the sclera, may be done so roughly that injury to the ciliary body later sets up an iridocyclitis. An iridectomy may be done before or even afterward, when the root of the iris is broken away from its peripheral adhesion. The breaking up of the suprachoroidal trabecular by the spatula is of help in opening up the suprachoroidal space, but if persisted in too violently more than 13 mm. behind the limbus, damage to the emissaria and contents, the lymphatics and cortex veins may occur.

Early failures of this operation were due to a limited opening, from 2 to 3 mm., avoiding a large dialysis

of the ciliary body. Quick replacement followed the return to increased ocular tension. A wide dialysis allows the ciliary body to sag, and the pull of the ciliary muscles, if not atrophied, both meridional and circular, for a time at least keeps the suprachoroidal space open. Aqueous interposed between the raw surfaces prevents adhesions from forming. In many cases, as soon as the tension begins to rise again, these parts are pushed together, shutting off drainage.

It may be a temporary procedure much like repeated anterior sclerectomies in secondary glaucoma cases due to an iridocyclitis. It has been said that interference with vascular and nerve supply to the ciliary body is such as to decrease the supply of aqueous formed, giving a satisfactory result as far as hypertension of the eye is concerned. Increased ocular tension after a cataract operation seems to do favourably with this operation.

#### CONCLUSION

The causes of failure in operations for the control of intra-ocular tension appear to be due to:

1. A well advanced ocular pathologic condition at the time of operative intervention.
2. The operative procedure not being the best one, in view of the tissue changes present.
3. Definite errors in operative technic and after-care.

### Mandelic Acid in the Treatment of Pyelitis in Childhood

By G. H. NEWNS, M.D., M.R.C.P. (Lond.)

and

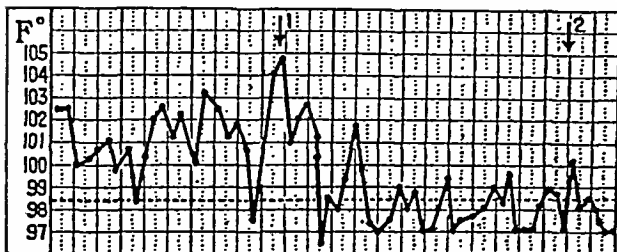
R. WILSON, M.D. (McGill), D.C.H.

(Abstracted from the *Lancet*, Vol. II, 7th November, 1936, p. 1087)

In 1931 Helmholz and Clark introduced the ketogenic diet for the treatment of urinary infections. In their hands it met with considerable success; their good results have also been obtained by many others. The drawbacks of this diet are that it needs much preparation and supervision, and owing to its high fat content it is nauseating to many patients. This last objection is a serious one in the case of children, who often refuse a ketogenic diet after they have had it for a few days.

In 1933, Fuller showed that the substance excreted in the urine, responsible for the bacterial action, was  $\beta$ -hydroxybutyric acid. Unfortunately this substance, when given by the mouth, is quite ineffective, owing to its complete oxidation in the body.

Rosenheim in 1935 experimented with allied hydroxy acids and observed their effect on *Bacillus coli* cultures *in vitro*. He found that mandelic acid had a bacterial action which compared favourably with that of



Effect of ammonium mandelate in a pyrexial case of pyelitis. 1—treatment started. 2—urine sterile.

$\beta$ -hydroxybutyric acid. He also showed that such action was over and above that which a mere alteration of the pH would produce. The drug is excreted unchanged in the urine and is non-toxic. Promising results were obtained when it was submitted to clinical trial. Lyon and Dunlop, who reported 16 adult cases

of pyelitis treated by this method, found that in most cases a sterile urine was obtained within ten days. Several relapses, however, occurred. Similar good results are reported by Holling and Platt. They used ammonium mandelate in four cases, in one of which it was necessary to supplement the drug with ammonium chloride in order to make the urine sufficiently acid.

This paper is a report of 36 cases of pyelitis in children under twelve years of age treated at the Hospital for Sick Children, Great Ormond Street, and at the Westminster Hospital. Of this series, three were male and all but five were between the ages of two and eleven. There were 24 cases of acute pyelitis, ten cases were chronic or relapsing, and in two albuminuria and casts were present, due probably to pyelonephritis. As a rule the infecting organism was *B. coli*. Late-lactose fermenters (3) and *B. proteus* and *B. mucosus capsulatus* (one each) accounted for the remaining cases. Ten of the children had been treated unsuccessfully with potassium citrate before the administration of mandelic acid. A pyelogram was obtained in ten cases, and this investigation resulted in the demonstration of an anatomical abnormality in three of these, one of which had unilateral hydronephrosis. Nephrectomy and a subsequent course of mandelic acid brought about the disappearance of the pyelitis in this last case.

#### METHODS

Mandelic acid with sodium bicarbonate was used in most of the cases, and was given in doses of 15 to 30 grains four times a day according to the age of the child (see table). As a rule half this dose of ammonium chloride was given to acidify the urine. In six cases, Neoket (a mixture of mandelic acid and acid sodium phosphate) was used, and in four, Mandelix\* (solution of ammonium mandelate), in doses of three to six drachms daily.

Daily determination of the pH was made. For use in the ward a Lovibond colorimeter with a pH scale between four and six was found to be satisfactory. Catheter specimens were taken at intervals of several days, these being cultured soon after they were taken to obviate any *in vitro* action of the drug on the organisms. It has been possible to follow up almost all of the patients during the months that have followed discharge.

To be certain that the dosage was sufficient, the urinary concentration of mandelic acid is now estimated.

TABLE.—Dosage of mandelic acid

Up to 6 months ..	..	30 grains daily
6 months to 2 years ..	..	30-60 " "
2 to 5 years ..	..	60-90 " "
5 to 12 years ..	..	90-120 " "

This is found to reach the level of 0.5 per cent, which Rosenheim regards as quite sufficient.

#### RESULTS

In all but three cases the urine was rendered sterile, often within a week of the beginning of treatment. The unsuccessful cases included a *B. mucosus capsulatus* pyelitis and a *B. proteus* pyelitis complicating pink disease. In the latter the pH did not fall at any time below 6.2. This rapid action of mandelic acid contrasted favourably with that of potassium citrate which was first tried in some of the cases.

Little difficulty was experienced in reducing the pH to the optimum level of 5.3. When Neoket was used, however, the pH fluctuated a good deal, and did not remain constantly below 6. For this reason, this preparation was discarded in favour of ammonium mandelate, the use of which was attended with much better results. Of the present series four were treated with ammonium mandelate. In addition six cases are at present undergoing treatment. This preparation is

\* Two fluid drachms contain 45 grains of ammonium mandelate.

now being used in all cases of pyelitis. In each case the pH was reduced satisfactorily, and the urine rendered sterile within a very short time. Rather larger doses are being used. In some later cases, however, it has been found necessary to supplement the ammonium mandelate with ammonium chloride.

Side effects were noted in two cases: in one of these diarrhoea developed, necessitating temporary cessation of treatment; the other child had some trouble with vomiting. No harmful effects on the kidneys were observed.

So far, of the 36 cases treated, nine have had relapses; three of these have had a second course of treatment which has produced a sterile urine. Of the nine relapses three were in patients with urinary tract abnormalities, and two in infections with an organism other than *B. coli*. Such infections do not yield so readily to mandelic acid therapy. Four cases are thus left for which no reason for relapse can be given.

#### CONCLUSIONS

1. Mandelic acid appears to be an effective remedy for *B. coli* pyelitis in children. The most striking feature is the rapidity with which the urine is rendered sterile.

2. Ammonium mandelate has been given with success and is now being used in preference to other

preparations. It is sometimes necessary to use ammonium chloride in addition.

3. Infants as well as older children have been treated without harm. Pyrexia and albuminuria are not contraindications to the use of mandelic acid.

4. Relapses have occurred in nine cases out of 36 (25 per cent). Three of these relapses were in patients with urinary tract abnormalities, while two had infections due to organisms other than *B. coli*, which seem to react less well to mandelic acid. Some of these relapses might have been prevented if mandelic acid therapy had been prolonged. It should be continued at least a week after the urine has become sterile, and probably longer, especially in the chronic cases. Some of these should attend as outpatients and receive continued treatment. Full doses for a short period seem to give better results than small doses for a longer time.

5. Chronic pyelitis may be secondary to an abnormality of the renal tract. It is necessary to exclude such a possibility by pyelography and other means in any patient that does not react favourably to a course of mandelic acid.

6. It will be necessary to follow up large numbers of cases for a considerable period before one can say whether mandelic acid will permanently cure pyelitis.

## Reviews

**THE PRACTITIONERS LIBRARY OF MEDICINE AND SURGERY. Volume XI:—Eye, Ear, Nose and Throat. 1937. D. Appleton-Century Company, Incorporated, New York and London. Pp. lxvii plus 1153. Illustrated. To be completed in 12 volumes and general Index. Sold in complete sets only. Rs. 485. Only available from Messrs. Butterworth and Company (India), Limited, Calcutta**

This volume consists of a number of articles on special subjects, written by 40 American specialists, most of whose names are well known both in America and in other countries, and arranged in such a way as to cover systematically the whole field of these special branches of medicine. The chapters are mostly of a practical nature and lay emphasis on the conditions that are likely to be encountered frequently by the general practitioner and that he is likely to be called upon to deal with.

Part I is on the eye: it is almost certainly the best part of the book. It is well arranged and covers the whole subject of ophthalmology systematically in about four hundred pages. Part II is on the ear, and consists of about two hundred and fifty pages. Part III, on the nose, nasopharynx and sinuses, is of about the same length. The last two parts, which are shorter, naturally, as they are more limited in scope, are on the pharynx and larynx, respectively.

In a book of this nature there are inevitably repetitions and an occasional omission. The latter is the more serious fault and we failed to find in the ear section any mention of some of the simpler techniques useful to the practitioner, *e.g.*, the introduction of the Eustachian catheter. Another fault, which is common to so many American textbooks, is lack of reference to some of the best British workers when they have been more successful than their American colleagues, *e.g.*, in the radium treatment of cancer of the larynx.

We could find no reference to epidemic dropsy as a cause of glaucoma but perhaps this is not surprising. Elliot's operation is described very shortly but a warning is given against undertaking this without sufficient experience. This is not quite the teaching in India where the country practitioner is urged to risk operative procedure when it is indicated even if he has not had a wide experience, as more eyes are ruined by being

left untreated than spoilt by the inexperienced ophthalmic surgeon.

If we have mentioned a few shortcomings, it is because they stand out in sharp contrast to the rest of the volume which is on the whole an excellent one.

**THE HISTORY OF THE ACUTE EXANTHEMATA (The Fitzpatrick Lectures for 1935 and 1936 delivered before the Royal College of Physicians of London).—By J. D. Rolleston, M.A., M.D., F.R.C.P., F.S.A. 1937. William Heinemann (Medical Books), Ltd., London. Pp. x plus 114. Illustrated. Price, 7s. 6d.**

THE book is based on the Fitzpatrick lectures for the years 1935 and 1936 delivered by Dr. Rolleston before the Royal College of Physicians of London. His long and intimate acquaintance with the infectious diseases and his reputation as a writer are in themselves guarantees of an adequate and satisfactory treatment of the subject; the book deals with the history of certain acute exanthemata, *viz.*, smallpox, chickenpox, scarlet fever, measles and German measles.

This little volume presents an important survey of the contributions to our knowledge of these diseases by the representatives of different countries. Of all the acute exanthemata the earliest to be described is smallpox; various views have been stated with regard to its classical antiquity. Inoculation against this disease, when first introduced in China, consisted of applying ground-up scales into the nostrils.

No definite description of chickenpox can be found before the sixteenth century and it is interesting to read its early history as well as that of scarlet fever and measles.

Certain original descriptions quoted in this book, such as that of Henry Koplik, of New York, regarding the presence of pathognomic spots on the buccal mucous membrane in the early stage of measles, would undoubtedly prove of more interest than many others made since.

There are references at the end of the each chapter and two indices, one of personal names and another of subjects, besides ten portraits of ancient workers of fame.

The book is intended to serve to some extent as a companion volume to the author's work on 'Acute

Infectious Diseases'. It will appeal to those interested in the history of medicine.

R. C. . .

**THE TREATMENT OF DIABETES MELLITUS.**—By Elliott P. Joslin, M.D. (Harvard), M.A. (Yale). With the co-operation of H. F. Root, M.D., P. White, M.D., and A. Marble, M.D. Sixth Edition. 1937. Henry Kimpton, London. Pp. 707. Illustrated. Price, 32s.

WE readily welcome the sixth edition of Professor Joslin's illuminating monograph, the predecessor of which we had the pleasure of reviewing about 18 months ago. The discovery of the new insulin compound, zinc protamine insulin, and the voluminous amount of work done on it all over the world necessitated the inclusion of two new chapters in the present edition. The monograph also incorporates the recent knowledge on diabetes and has been thoroughly revised in the usual perfect and careful manner of the author.

Regarding the future of zinc protamine insulin Professor Joslin entertains high hopes. He thinks that the discovery of the new insulin compound will be the beginning of a new and better epoch for the diabetic patient, but, conservative as he always is, he advises both doctors and patients to cultivate patience and caution regarding its use at present.

It is undoubted that Professor Joslin's book is a recognized classical work and a standard book of reference. The amount of important, useful and up-to-date observations made within its pages is amazing—it is a *vade mecum*, which, we feel sure, will prove invaluable to students and practitioners all over the world.

J. P. B.

**THE DIABETIC LIFE: ITS CONTROL BY DIET AND INSULIN.**—By R. D. Lawrence, M.D., F.R.C.P. (London). Tenth Edition. 1937. J. and A. Churchill Limited, London. Pp. x plus 246, with 18 illustrations. Price, 8s. 6d.

LITTLE comment is necessary on the tenth edition of Dr. Lawrence's book, the predecessor of which we had the pleasure of reviewing only about a year ago.

No fundamental changes appear to have been made in the present edition except that a new chapter on zinc protamine insulin has been put in the appendix. The author is of opinion that this new insulin compound, in the long run, will be a boon to a far greater number of diabetics than any previous form of insulin. It would be wise, however, to use it cautiously at present, keeping a close and individual watch on the patients.

We believe that the book will continue to be as useful and popular as its predecessor.

J. P. B.

**TRAUMA AND DISEASE.**—By Leopold Brahdry, B.S., M.D., and Samuel Kahn, B.S., M.D. 1937. Henry Kimpton, London (263, High Holborn, W.C.). Pp. 612. Illustrated. Price, 35s.

It is not uncommon to find, in medical textbooks, trauma among the etiological factors in many diseases, but hardly any data are given on which the physician can base his own opinion. The literature is always meagre except for case reports, and certain articles widely scattered in medical journals to which the practitioner has usually no access. The rapidly growing social and legal implications of the relationship between trauma and disease have served to focus medical attention on the subject and a treatise dealing with it is, therefore, welcome.

This volume deals with the effect of a single trauma—either physical or psychic—in producing disease or influencing its course. Conditions which are obviously caused by a single trauma, *viz*, sprains, lacerations, fractures, etc., have been excluded as far as possible. Authorities in different fields of medicine have contributed to the book, and therefore the facts are based

on pathological and clinical investigations and not on legal decisions.

It is undoubtedly difficult to evaluate the rôle of a single trauma in the production of disease. A trivial abrasion may cause septicæmia by admitting virulent bacteria from the surface. A blow on the chest may activate some latent tuberculous focus in the lung. An injury, on the other hand, may be the result of another disease, *viz*, the one following a fall due to a cerebral vascular lesion. It may again lead to the recognition of an already existing condition, for instance, a burn may call attention to the anæsthesia secondary to leprosy. Besides, there are many conditions which usually develop without trauma but in which trauma may be a causative factor, *viz*, angina pectoris, exophthalmic goitre. Notwithstanding such difficulties and confusions, the book well provides a composite picture of various conditions caused directly or indirectly by trauma, in an excellent manner. They have been discussed with details based on clinical, experimental, statistical and/or post-mortem evidence. A large number of illustrative case reports have been cited with adequate discussions, comments and diagrams whenever required.

The rôle of trauma appears to have been over-estimated in certain places, for example: 'Pneumonia may at times follow comparatively trivial chest injury, and, although it seems scarcely just to burden an insurance carrier with so serious an outcome, the fact remains that had there been no injury it is not likely that there would have been a pneumonia'.

Statements, such as 'auricular flutter and auricular fibrillation.....are relatively harmless, except in the presence of the serious heart disease and with uncontrolled ventricular rate', are questionable.

Some of the conditions not considered as traumatic in origin, such as piles, prolapse of the rectum and hepatic cirrhosis, have also been dealt with in this book. It has been stated that no amount of straining or pressing associated with constipation or diarrhoea seems capable of causing a prolapse of the rectum.

Occasional clinical description, such as that of syringomyelia on page 329, is unnecessary in a book of this type.

The volume, however, admirably presents the accumulated knowledge concerning the relationship of a single trauma to disease, and, as such, should prove useful to the physician, especially one connected with industry and labour. A bibliography has been given at the end of each chapter. The get-up of the book is excellent.

R. C.

**HANDBOOK OF ORTHOPÆDIC SURGERY.**—By A. R. Shands, Jr., B.A., M.D., in collaboration with R. B. Raney, B.A., M.D. 1937. The C. V. Mosby Company, St. Louis. Pp. 593, with 169 illustrations. Price, \$5.00

THE writing of a handbook on a special subject in surgery is not an easy task. In this book an attempt has been made to present, not the views of one man or of one school, but the consensus of opinion as recorded by twenty-four teachers of orthopædic surgery, representing eighteen different teaching institutions.

The subject-matter has been divided into twenty-four chapters in accordance with a report of the committee on under-graduate instruction on orthopædic surgery of the American Orthopædic Association. The opening chapters deal with congenital deformities. These are followed by the diseases of growing and adult bones. There are four chapters on infection of bones, two of which deal with tuberculosis. The section on chronic arthritis is worthy of note. It includes an abstract of the 'arthritic primer' published by the American committee for the study and control of rheumatism. There are three chapters on neuromuscular disabilities and a short one on new growths of bone. As one may expect the nomenclature used is the one formulated by Codman and the registry of bone sarcoma of the American College of Surgeons. There is also a special



chapter on diseases of the spine and thorax. The chapter on the 'low back' is based on *Diseases and deformities of the spine and thorax* by Dr. Steindler. The remaining chapters deal with diseases of other important joints. There is an excellent bibliography, which contains most of the outstanding articles on orthopaedic surgery in the English language. Although the illustrations are clear and adequate, it is to be deplored that no photographs and untouched skiagrams are included in this book. It is a book of convenient size and is well-suited for the needs of the general practitioner. It is hoped that it will also be of help in the teaching of orthopaedic surgery. The printing and get-up are excellent and an adequate index is appended.

P. N. R.

**MEDICAL UROLOGY.**—By I. S. Koll, B.S., M.D., F.A.C.S. 1937. The C. V. Mosby Company, St. Louis. Pp. 431, with 92 text illustrations and 6 coloured plates. Price, \$5.00

In the preface the author remarks that usually in textbooks on urology too much is taken for granted, he has therefore made an effort in this book to supplement this deficiency in a concise and clear manner. It is a book of handy size and consists of six parts. Part I deals with diseases of the urethra and genitalia. The chapter on gonorrhoea is well set out. The medical profession is invited to pay more serious attention to the question of marriage of persons afflicted with gonorrhoea. Emphasis has been laid on the fact that cases are not rare where a honeymoon has been abruptly ended by the bride's falling a victim to the gonococcus with resulting sterility and invalidism. One of the author's exhortations may be quoted here:—'Fathers, when interviewing their respective sons-in-law, should enquire into their genito-urinary condition as well as about their financial position!' According to the author's estimation, from 75 per cent to 85 per cent of the male population of the U. S. A. either are, or have been, infected with gonorrhoea. Among diseases of the prostate, the term 'prostatic hypertrophy' still finds a place. The term 'enlarged prostate' would be preferable. Prostatic resection has been advocated by way of treatment.

Part II deals with venereal lesions of the external genitalia and adnexa. Diseases of the kidneys and ureters are considered in part III. Regarding surgical treatment of nephrolithiasis, the author states, 'Any stone, regardless of how small, which is causing gross hæmaturia, should be promptly removed'. It may be pointed out that surgery of the very small stone is not a matter to be lightly undertaken. Part IV is devoted to the diseases of the urinary bladder. Vesicalgia is also included. Part V deals with verumontanitis, sexual impotence, and sterility, subjects which are generally neglected in textbooks. Differential diagnosis is briefly discussed in the concluding part.

This book is likely to be of use to the general practitioner, but it is doubtful if it would be of much help to the practising surgeon. The printing, get-up, and illustrations are very good indeed. There is a useful index.

P. N. R.

**CUNNINGHAM'S TEXTBOOK OF ANATOMY.**—Edited by J. C. Brash, M.A., M.D., F.R.C.S. (Ed.), and E. B. Jamieson, M.D. Seventh Edition. 1937. Oxford University Press, London. Humphrey Milford. Pp. xxvi plus 1506. Illustrated with 1,171 text-figures, 653 of which are printed in colours, and 76 plates including 121 radiographs. Obtainable from Oxford University Press, Bombay and Calcutta, India. Price, 42s.

ANATOMY has long since ceased to be simply a study of the dead body and, although the dissecting room will probably always remain the best field for acquiring a ground knowledge of the science, the student of to-day is being encouraged to study the living subject far more than was his predecessor of a generation ago. This is of course reflected in the textbooks of anatomy.

British medical students of two generations owe a debt of gratitude to Professor D. J. Cunningham; few are unfamiliar with either the 'big' or the 'little' Cunningham and many have relied entirely on these two books for their studies in anatomy. The 'big' Cunningham was first published in 1902 and it saw three editions under its original author; Professor Robinson then undertook the editorship from 1913 to 1931 when the sixth edition was published; and now the editorship has still remained at Edinburgh and is being shared by the last editor's successor in the chair of anatomy at that University, Professor J. C. Brash, and Dr. E. B. Jamieson, lecturer on anatomy.

As well as the two editors there are ten other contributors each of whom has undertaken rewriting or revision of some sections of the work. These contributors are, with one exception, professors of anatomy at different universities in Great Britain, the exception being a professor of clinical surgery, and very suitably the section for which he is responsible is that on surface and surgical anatomy.

Although our knowledge on the subject is continually increasing, revolutionary discoveries are seldom made and consequently the main advances to be noted are in the presentation of the subject. Skiagrams of the skeletal tissues have formed an important feature of textbooks on anatomy for many years. There are in the present volume some very excellent ones. Some are of the living subject, others of dried bones. The excellence of some of the skiagrams, especially of those showing the soft tissues made visible by various means, is perhaps one of the most striking points about this edition. (However, the reviewer cannot see why plate XXXVIII is reproduced again as plate XLVI: the skiagram and the caption both appear to him to be identical. After puzzling over it a long time, probably unnecessarily, he decided that p. 529 and p. 592 were in some way concerned.) There are also some really remarkable photographs in the section on myology. In the text-figures colour has been used whenever this clarified them.

The modifications of the Basle Nomina Anatomica approved by the Anatomical Society of Great Britain and Ireland at Birmingham in 1933 have been used throughout with the B. N. A. name in brackets where this differs materially from the British modification. There is also a glossary in which the B. N. A. and the Birmingham (B. R.) names are given side by side.

This is almost certainly the best textbook of anatomy in the English language.

**BUCHANAN'S MANUAL OF ANATOMY INCLUDING EMBRYOLOGY.** Edited by J. E. Frazer, D.Sc., F.R.C.S. Sixth Edition. 1937. Baillière, Tindall and Cox, London. Pp. x plus 1772, with 1,042 illustrations. Price, 35s.

ANATOMICAL nomenclature has been a subject of considerable divergence of opinion amongst teachers of anatomy in different schools of Great Britain. The Latin nomenclature of the Basle Nomina Anatomica was not popular and, though it necessarily found its way into some textbooks of anatomy, others ignored it and it never filtered through into surgical textbooks to any great extent. The revision adopted by the Anatomical Society of Great Britain and Ireland at Birmingham in 1933, which was not a sweeping revision but in most instances a somewhat free English translation of the B. N. A. nomenclature, was very welcome, and will go a long way towards simplifying the subject of anatomy for the present generation of students.

Buchanan's well-known *Manual of Anatomy* never adopted the B. N. A. but adhered to the old English nomenclature. However, the present editor, who is professor of anatomy at St. Mary's Hospital, has now accepted the Birmingham revision and taken the opportunity of introducing it into the sixth edition of this work. Other revisions of the text have been made and some new illustrations have been added.

Buchanan's is a very 'human' and practical book on anatomy. One feels the personal influence of the



original author whilst reading it, which is perhaps lacking in some of the more encyclopædic volumes on anatomy.

It is well-illustrated throughout and many of the illustrations are coloured.

There is a very useful glossary at the end, as well as a very complete index. It is a book that should suit the student of the medical schools in India.

**PRACTICAL PSYCHOLOGY FOR NURSES AND OTHER WORKERS IN MENTAL HOSPITALS.**—By W. J. T. Kimber, L.R.C.P., D.P.M. 1937. Oxford University Press, London. Humphrey Milford. Pp. vii plus 103. Obtainable from Oxford University Press, Bombay and Calcutta. Price, 3s. 6d.

THIS little book should be very welcome in this country where the notion that there is such a thing as 'mental nursing' is just beginning to dawn on the medical profession. The book is divided into two parts. The first the author terms 'the psychological approach'. Here is given a short account of psycho-analysis and the views of Adler. Adapting Adler's concept of 'inferiority', the author regards mental disorder as the sufferer's refuge from an environment which is more

than he can cope with. In other words, a flight from reality. The nurse is shown how one of her principal duties towards a mentally disordered patient is to make as good a contact as possible to assist in the educative side of the treatment. She is warned against employing control in a manner that might suggest to the patient that the control is used as a 'punishment'. Occupational therapy and the importance of social activities are duly stressed. There is a good account of the rôle of the psychiatric social worker. The value of religion as a therapeutic agent receives notice. In this connection some readers may be unable to agree with the author's opinion that psychology is in harmony with the doctrine of Christianity, except and in so far that Christianity is a religion. Here and there the author employs terms which only an exceptionally well-educated nurse would know the meaning of, e.g., conative.

The author ignores entirely the question of 'bad habits' in patients. This is a pity, as it is the nurse who can do so much to correct or to eliminate disagreeable habits in patients. He does not seem to be acquainted with that useful form of record in an up-to-date mental hospital, viz, a habit formation chart.

O. B.-H.

## Abstracts from Reports

### KING EDWARD VII MEMORIAL PASTEUR INSTITUTE AND MEDICAL RESEARCH INSTITUTE, SHILLONG. THE NINETEENTH ANNUAL REPORT FOR THE YEAR ENDING 31ST DECEMBER, 1935

*Anti-rabic section.*—The preparation of the vaccine, the scheme of treatment and the dosage remained unchanged throughout the year. Kasauli virus was used for preparing the vaccine.

The treatment was carried out at Shillong itself and at 21 public and 39 private centres authorized by Government.

During the year 1,948 persons, or 30 less than in 1934, applied for treatment at Shillong and its centres. Of these persons, 1,550 completed the treatment. Two hundred persons absconded before the course of treatment was completed, and no after-history of these cases was obtained. Twelve of these cases were under treatment at Shillong and the remainder, 188, at the centres.

The submission of health returns of patients who were fully treated, which are due six months after the treatment, was again very satisfactory, nearly 95 per cent of the total treated being received up to the time of writing this report.

No 'accidents of treatment' were reported during the year.

The filling up of the history cards by medical officers in charge of treatment centres, which was adversely commented on in last year's report, was unfortunately far from satisfactory this year also and it has been extremely difficult to extract from the cards the data necessary for compiling the essential statistical tables. In view of this it is considered that the statistics of treatment at the centres are so unreliable as to be of little or no value. The unsatisfactory recording of the necessary particulars on the history cards is, in the writer's opinion, mainly due to the fact that the centres are placed in charge of medical officers who have not had and who are not required to undergo any training in anti-rabic treatment methods. The writer cannot but feel that this lack of training is detrimental to the success of the decentralization scheme, possibly even to the treatment itself, besides allowing much valuable statistical material to go to waste.

Another contributory cause to the defective completion of the history cards is undoubtedly that many

medical officers, in charge of private centres especially, appear to issue vaccine from their centres to other persons or medical men for the treatment of persons elsewhere than at an authorized centre. Cases have occurred within the writer's experience where incomplete or unsatisfactory history cards sent for correction have been repudiated on the grounds that the patient was not treated by the medical officer in charge of the centre. The *raison d'être* of authorized centres presumably is that anti-rabic treatment should only be given at the centre under the supervision of a medical officer qualified for this particular work and that persons requiring treatment should be sent there for that purpose. While one is aware that this ideal may at times be difficult to follow, either because of lack of communications or because the patients are employees of some firm or company other than that owning a private centre, nevertheless it is felt that the practice of re-issue of vaccine by medical officers in charge of centres is more common than it need be, and that it should be discouraged. It is suggested that it should be clearly stated in the rules governing the conduct of treatment centres that the re-issue of anti-rabic treatments by medical officers in charge of centres is not recognized and that if for any special reason they are obliged to issue vaccine for treatment of a case elsewhere than at their centre they will be held responsible for all charges, for the proper treatment of the case and for the correct completion of the necessary returns.

An attempt was made to compensate for the lack of anti-rabic training among medical officers in charge of centres by the issue, in July, from this institute of a memorandum of anti-rabic treatment in which detailed instructions dealing with the treatment generally and the maintenance of records were given. A copy of this memorandum was sent to all the treatment centres. The writer regrets to report that in far too many cases little effort appears to have been made by some medical officers to follow and act upon these instructions. Whilst there has certainly been some improvement in the history cards since the issue of the memorandum, many cards are still received which show that the instructions have either not been read or, if read, have not been understood.

*Bacteriophage section.*—The cholera situation in Assam during 1935, as might be expected, also had its

effect on the issues of bacteriophage, which were larger than in any previous year. During the year, 1,020,481 doses were supplied, as compared with the previous maximum, last year, of 871,316 doses.

This amount was distributed as follows:—

Six lakhs seventy-five thousand three hundred and sixty doses free to the controlled areas of Nowgong and Habiganj; 61,896 doses to Government institutions in the province; 109,984 doses to tea gardens; 4,496 doses to railways; 2,048 doses to missions; 30,441 doses to private persons and institutions; 4,608 doses to municipalities; 79,712 doses to other local boards; and 51,936 doses to other governments.

It is interesting to note that a supply of bacteriophage is carried on the passenger trains of the Assam-Bengal Railway for issue to passengers and crew who may be attacked by cholera or dysentery *en route*, whilst a small stock is also held by the station masters of the more important stations.

#### ASSAM MEDICAL RESEARCH SOCIETY

The society has completed its fifth year of activity and the results of surveys and researches undertaken during this period in the various parts of the province have given valuable information on the bionomics of the malaria-carrying species of mosquito and have indicated means by which this species may be controlled. These studies have been made in areas where the different geographical conditions altered considerably the breeding of the species and the weight of the malaria case incidence among the population at risk.

The annual contribution for 1934-35 from the Government of Assam was Rs. 25,000 and, in addition, the society have received from the Indian Research Fund Association, Rs. 15,000; Indian Tea Association, Rs. 5,000; Assam-Bengal Railway, £100; Assam Oil Company, £100 and from Local Bodies, Rs. 5,660-11. For the year 1934-35, the total expenditure, which was Rs. 61,556-7-9, exceeded the income, Rs. 54,801-12-1, but the amount carried forward from the previous year, Rs. 7,580-12, was sufficient to allow the society to carry forward to 1935-36 Rs. 826-0-4.

To ascertain whether the breeding cycle of *A. minimus* was completed throughout the cold weather, an experiment was undertaken in the northern-most and coldest part of Assam under conditions as nearly natural as possible. Eggs laid on the 28th January by caught gravid *A. minimus* were placed immediately in a stream pocket previously cleared of all larvæ and water insects. The stream at this point was closed in by a mosquito net with gauze bottom, and the bottom of the net so buried as to allow the water to flow through but to exclude the entry of any other larvæ or insects. Eggs average 9 days to hatch, 17 days in the larval stages and 4 days as pupæ; a total of 30 days from the egg to the adult stage. From 192 eggs, 23 adults emerged (14 males and 9 females). The minimum and maximum temperatures averaged 54°F. and 71°F., respectively, during this period. In similar experiments carried out in April and May, the developmental cycle from the egg to the adult stages was 16 to 17 and 12 to 13 days, respectively.

The breeding experiments reported in 1934 have been confirmed during this year. Three generations of *A. minimus* have again been bred out in captivity. Further experiments have shown that with one mating at least three batches of eggs can be fertilized by the spermatozoa retained in the spermatheca of *A. minimus*. Other experiments have shown that the eggs of *A. minimus* are fertilized by the spermatozoa during the act of oviposition, i.e., after leaving the ovaries.

**Malaria control.**—(a) Last year the periodicity of certain malaria factors in Assam was discussed. Further observations on malaria in Assam with special reference to cold weather and pre-monsoon anti-larval control have shown that the breeding conditions of *A. minimus*, the significant vector of malaria in Assam, fall in three separate groups which have been defined. The study of the malaria problems in two of these group areas shows that breeding of *A. minimus* during the period early January to mid-June is the principal responsible

factor for the increase of malaria incidence in moderately epidemic and hyperendemic areas. The application of anti-larval activities during the period early January to mid-June (i.e., until such time as nature assumes control of these breeding places of *A. minimus*) would be more economical than the present advocated period of anti-larval control (15th March to 15th November) as, during the former period, much smaller water areas would have to be controlled, with the habitat of the vector thus concentrated. Breeding then would be stopped at its lowest point in the cold weather, preventing not only the geometrical increase in the numbers of the vector, but, in its absence, preventing the propagation of gametocytes and residual infections, thus protecting the uninfected.

The bulk of the malarigenous areas in Assam, particularly in the case of villages, comes under the classification of moderately endemic. Often, in the case of villages, a single small stream is the responsible breeding habitat; therefore the significance of these findings is obvious, for, if we can control malaria by the application of anti-larval measures applied to the small running water areas present in the cold weather and pre-monsoon months, it becomes an economic possibility to alleviate the plight of the bulk of villagers in Assam.

(b) A method, and the apparatus, for applying anti-larval oil by a modified brushing method has been worked out. This method will reduce expenditure on manual labour and oil.

#### CHOLERA (BACTERIOPHAGE) ENQUIRY UNDER THE INDIAN RESEARCH FUND ASSOCIATION

**Field work.**—There was a widespread epidemic of cholera in Assam during the first half of 1935. An attempt has been made to evaluate the results of bacteriophage treatment, which has been widely used in the province. The figures were collected from the weekly returns submitted to the Director of Public Health by the district civil surgeons. The services of a statistical clerk working in this institute under the Indian Research Fund Association were available for this purpose from April 1935.

**The nature of bacteriophage experiment in Assam.**—At the outset we may recapitulate the nature of the present experiment. In the two districts—Nowgong and Habiganj—which are regarded as bacteriophage-control areas, bacteriophage is distributed to all the villages in the district, so that it is available for the treatment of the early cases in the villages. It was assumed that, apart from its effect on mortality, the infectivity of the vibrio would be reduced and the infection would not take root. Cholera vaccine has not been used in these two districts—since 1929 in Nowgong and 1932 in Habiganj. In judging the effect of phage distribution in these areas the other districts in the province had been taken as controls. These are not however controls in their strict sense, for during an epidemic bacteriophage is being widely used by the Public Health Department, along with preventive inoculation and other measures. One might suppose, however, that, as early cases are not being treated with bacteriophage in these other areas, the progress of an epidemic would not be modified to any great extent. However, the use of cholera vaccine along with bacteriophage there introduces another complication from this point of view. In these circumstances, it is difficult to assess the value of bacteriophage as the sole measure in the prevention and control of cholera in the experimental areas.

**Epidemic in the Brahmaputra valley.**—While the epidemic started in the Goalpara district (3rd January, 1935) on the Bengal border, it attained its maximum virulence in the Kamrup district. The Barpeta subdivision of this district was the first to be affected (23rd February, 1935). It appears that the infection was first introduced among the Cacharis residing at the foot of the hills on its northern border, and with their migration spread southwards along the streams, and eastwards into the Gauhati subdivision (15th March, 1935). It spread southwards along the streams in this subdivision

also. Gauhati town on the southern bank of the Brahmaputra was then affected (26th April, 1935), whence the infection spread to a few villages lying along the main road but westwards.

There were 1,703 cases and 1,050 deaths in the Barpeta and 1,045 cases and 721 deaths in the Gauhati subdivisions.

Darrang on the northern bank of the Brahmaputra was the next district to be affected. The epidemic in this district was not so severe as in Kamrup. During the period under report there were only 243 cases and 109 deaths in the Mangaldai subdivision and 100 cases and 44 deaths in the Tezpur subdivision.

While the two joining districts were thus affected with cholera, the Nowgong district almost escaped infection. Four villages alone were infected—with nine cases and seven deaths. For the sixth year in succession Nowgong then remained free.

Could the freedom from cholera this year be attributed to bacteriophage control? This is suggested but the proof is not conclusive. The presence of at least four different foci of infection in the district and the fact that no serious epidemic resulted therefrom suggest that the bacteriophage control was effective. It might also be that this freedom from infection was accidental; there is reason to believe, if we take into consideration the route of infection in the adjoining districts, that this district was not seriously threatened with an epidemic.

A spot map of this area shows that the epidemic which started in the Goalpara district spread eastwards to both the subdivisions of Kamrup and ended just over the border of Darrang, a district adjacent to Nowgong on the other side of the Brahmaputra river and from whence Nowgong is liable to become infected. Sporadic outbreaks occurred in Darrang but those parts in close proximity to Tezpur and Silghat—the main channel of communication between Darrang and Nowgong—remained comparatively free.

In the past, epidemics of cholera in Nowgong were associated with the spread of the infection along villages on the Kalang river—a dying river and a feature stressed by Colonel Morison. This river bed was not infected this year.

If the bacteriophage control has been effective in Nowgong, it is reasonable to assume it should be effective in Habiganj also. A study of the epidemic in the Surma Valley does not show conclusively that it had been so.

*Epidemic in the Surma Valley.*—There was a widespread epidemic, though of less intensity than in Kamrup, in the Habiganj and other subdivisions in the Sylhet district. As we have suggested previously, the infection was probably introduced from Bengal.

The epidemic in all the subdivisions of this district was studied in some detail. Statistics were collected for each village from the weekly returns submitted to the Director of Public Health.

In view of the good results obtained in former years, a question has been raised whether the infection in Habiganj was due to a non-typical cholera vibrio. Off and on a few samples of stools from clinical cases of cholera were sent to this institute for bacteriological examination. These have yielded non-agglutinating vibrios. These strains are at present under investigation.

Judged on this year's findings alone, it would appear that bacteriophage has not yielded such striking results as former reports had led us to expect. When, however, we take into consideration the total cholera mortality in the plains districts of Assam, where cholera occurs with periodic regularity, we find in the pre-vaccination period, i.e., 1906 to 1919, that there were five years of high mortality ranging from 39 to 61 per 10,000 of population. Between 1920 and 1929, i.e., during the period when cholera vaccine was being used, there were four years when mortality varied from 19.5 to 25.5 per 10,000 of population. Since 1929, when bacteriophage was introduced, and especially in the last three years when it was being used extensively in all epidemics in all parts of Assam, the mortality has not risen above

8.5 per 10,000 and, during 1934, was less than 2.5 per 10,000 of population.

There are thus three distinct periods, viz, pre-vaccination, vaccination and vaccine with phage, the first showing a high degree of mortality, the second a moderate, and the third a low degree of mortality.

Taking a five-yearly moving-average mortality curve, on the basis that epidemics recur with five-yearly periodicity, we find that there is a definite diminution in mortality from 1906 to 1934. One drop is marked after the introduction of vaccine and the second when bacteriophage was added as an additional measure. There are certainly other obvious factors which have contributed to this reduction in mortality. Such a reduction cannot, therefore, be attributed solely to the use of vaccine alone, or vaccine and phage.

Even so, the drop in mortality in Nowgong and Habiganj, judged either from the annual or a five-yearly moving average, is more marked than in other areas in the province. A conclusive proof of the utility of phage could only be obtained if the experiment was continued in these two experimental areas and phage was withdrawn entirely from other cases. It is, however, probably now too late to consider this, as public opinion is firmly established in favour of bacteriophage.

In May, sporadic cases of cholera occurred in the virgin soil of the Manipur State, resulting in a severe epidemic in July, August and September, with 2,315 cases and 1,149 deaths. With our field unit, we examined part of this epidemic bacteriologically, and complete data of cases were obtained. The epidemic was due mainly to typical agglutinating vibrios, but non-agglutinating vibrios were obtained from a few clinical cases. Both bacteriophage and essential oils were used for treatment. The mortalities, in cases receiving no treatment, and in those treated with bacteriophage and essential oils, were 71.6 per cent, 32.3 per cent and 36.4 per cent, respectively.

In this area, therefore, bacteriophage appeared to be distinctly successful in the treatment of the disease, though not apparently more successful than essential oils. This epidemic appears to demonstrate a fact which past experience has inclined one to suspect, namely, that when bacteriophage is used for the treatment of the disease in an area where it has not been used before its success is marked, whereas it tends to become less effective, both in prevention and treatment, after prolonged and extensive use in the same district. Whether this is really the case or there are other unknown factors at work is not at present known, but the history of Habiganj in the last two years and the bacteriological findings in the few cases we have been able to investigate from that district suggest the possibility that the prolonged use of bacteriophage throughout the population may result in the evolution of a type of cholera vibrio which, whilst still capable of producing the disease, has become insusceptible to the action of bacteriophage. Investigations are now in progress which it is hoped will throw some light on this problem.

#### BASIC RESEARCH

A very great deal of work has been done in attempting to throw further light on the part played by bacteriophage in the epidemiology of cholera and its effect on the cholera vibrio.

*The duration of potency of cholera bacteriophage.*—A period of about 18 months has hitherto been estimated—possibly rather empirically—as the time after preparation during which therapeutic bacteriophage was considered suitable for use. The experiments outlined here were undertaken to ascertain how far this estimate was justified.

*Two lines of investigation were carried out.*—(a) The duration of potency of individual types (A to K) of bacteriophage stored as pure types, and (b) the duration of potency of the several types when stored in combination as in the ordinary therapeutic brew.

For the single type phages, each type was grown with the same cholera strain in six different media, in order

to determine whether any particular medium was more favourable for preserving the types in storage. The filtrates, i.e., the bacteriophage, after testing for initial potency, were stored (a) in cold storage, (b) at room temperature, and (c) at incubator temperature, and their individual potency was tested at intervals up to one year.

In the case of the therapeutic brews, ampoules of certain brews prepared for issue in the ordinary way were, after testing for initial potency, stored at room temperature and re-tested at intervals.

From the results obtained we were able to draw the following preliminary conclusions:—

1. Peptone water appeared to be the best medium for preserving the potency of all types, and is quite as good as any other medium used in this investigation for the growth of cholerae phage.
2. All types tend to die out when stored at 27°C. and show considerably reduced titres after four and a half months at that temperature.
3. All types retain their potency longest when kept in cold storage.
4. 'K' type tends to die out quickest.
5. 'A' type is the most resistant type to heat, and in peptone water 'B' and 'C' types are also capable of resisting high temperatures for a long period.
6. In ordinary therapeutic bacteriophage, stored at a temperature of 60°F. to 80°F. (the room temperature at Shillong according to season), all the types except A, B, C, H and, possibly, L are reduced in potency after seven to eight months and tend to drop out altogether with further storage.

These findings confirm an accidental observation made some time ago, which was partly responsible for fixing the life of bacteriophage brews at 18 months, and incidentally they show up the fallacy of the conclusions drawn from this observation.

Some old brews which had been kept in the plains for periods up to five years were returned to the institute where, on testing, they were found to contain types A, B and C in considerable potency. At the time these brews were prepared, however, A, B and C types were the only ones definitely isolated and, since it was not expected that the other types subsequently discovered would vary much in stability, it was considered that 18 months was a safe period within which the bacteriophage might be used.

The experiments just completed show that types A, B, and C are particularly resistant to deterioration, but that the other types now included in the brews are considerably less stable. It is evident, therefore, that if the presence of as many different types as possible is of importance in enhancing the value of therapeutic bacteriophage, the life of the brews now given as 18 months is far too long, especially in the warmer climate of the plains. Under present conditions of manufacture and storage it is probable that six to nine months is the limit up to which therapeutic phage will retain full potency unless stored in the cold, and this fact may possibly be to some extent responsible for the disappointing results we have had to record from time to time when bacteriophage has been used for the control of cholera in Habiganj and elsewhere.

This period could, however, undoubtedly be greatly extended by storage at refrigerator temperature and the experiment with individual types indicated that the use of peptone water, instead of ordinary broth for the manufacture of therapeutic phage, would be advantageous.

We are now endeavouring to prepare in the laboratory a cheap medium which will have this advantage.

[A considerable volume of work on the cholera vibrio is also reported upon, and it is of great interest but is somewhat too technical for inclusion in this abstract. Bacteriologists who are interested should consult the original.]

## ANNUAL CLINICAL REPORT OF THE GOVERNMENT HOSPITAL FOR WOMEN AND CHILDREN, EGMORE, MADRAS, FOR THE YEAR 1935

*Indoor patients.*—The total number of indoor patients admitted in the hospital during the year was 9,796, being 310 more than in 1934.

The number of delivery cases excluding 325 abortions admitted during the year was 3,740 and the number of children born was 3,802, of whom 298 were stillborn and 192 died.

*Maternal morbidity.*—As in previous years, the standard adopted in estimating morbidity rate has been a rise of temperature of 100°F. or over on any two occasions, between the second and eighth days of the puerperium. There were 582 morbid cases including death of 65 mothers during the year.

*Normal delivery.*—There were 3,092 normal deliveries, of which 593 cases were complicated with some disease or condition dangerous either to the mother or to the child.

*Malpresentations.*—In 75 deliveries the occiput failed to rotate to the front. There were 83 cases of breech, 17 compound, 14 face, 13 transverse, three glabellar and one of brow presentation. Other abnormalities consisted of 60 cases of twins and 40 of placenta prævia. Thirty-eight cases were complicated with accidental hæmorrhage.

*Eclampsia.*—Seventy cases were admitted during the year. These include seven antenatal cases, of which five died and the remaining discharged were undelivered, and two post-maternal cases admitted 24 hours after delivery at home.

*Obstetric operations.*—There were 272 cases of application of forceps. One hundred and forty-eight mothers were primiparae.

Attempts made in hospital to deliver with forceps failed on nine occasions.

Of the 52 women delivered by Cæsarean section 38 were admitted in labour and 14 before the onset of labour pains. Four of the mothers were sterilized at their request.

Craniotomy was performed in 17 cases, decapitation in one and hysterectomy in four cases.

## QUARTERLY REPORT OF THE MYSORE STATE DEPARTMENT OF HEALTH, JULY TO SEPTEMBER, 1936. By P. PARTHASARATHI, L.M.S., B.S.Sc., L.R.C.P., L.R.C.S., D.P.H., D.T.M., DIRECTOR OF HEALTH

*Bangalore city.*—During the quarter, 13 attacks with 10 deaths were recorded under plague; 3,228 anti-plague inoculations were performed. Smallpox accounted for one attack with nil death. Of 1,888 primary and 454 re-vaccinations done, 80.6 per cent of the primary known cases were reported successful. Cholera was responsible for three attacks with three deaths and 1,852 persons were given protective inoculations.

Two fatal attacks of measles, two attacks of diphtheria, seven attacks with four deaths from whooping cough and 72 attacks with 12 deaths from enteric fever were reported. A total of 1,194 anti-typhoid inoculations was performed.

*Mysore city.*—There were five attacks with three deaths from plague reported and 2,118 persons were given anti-plague inoculations. A single fatal attack from smallpox was reported. A total of 2,630 vaccinations was performed during the quarter as compared with 5,074 in the previous quarter. The city was free from cholera. Seven fatal attacks of influenza and 14 deaths from typhoid were also reported; 242 anti-typhoid inoculations were done.

*Kolar gold fields.*—The area was completely free from plague and cholera in the quarter under report. Eight attacks with one death from smallpox were recorded. Intensive vaccination and re-vaccination campaign was undertaken; 2,985 vaccinations were performed, of which 973 were primary and 2,012 re-vaccination, the percentage of success among the known primary cases being 85.4. At the close of the quarter,

476 children remained unprotected. Two fatal cases of hydrophobia and three of enteric fever were reported.

**Mysore district.**—In the quarter under report, thirty attacks with 23 deaths from plague, 20 attacks with five deaths from cholera and nine attacks with four deaths from smallpox were reported. As a control measure 8,786 anti-plague inoculations, 1,989 anti-cholera inoculations and 6,824 primary and 2,028 re-vaccinations were done. The hookworm control unit continued the mass treatment work in the Periyapatna taluk.

**Shimoga district.**—During the quarter eight attacks with four deaths from plague, 144 attacks with 33 deaths from smallpox and four attacks from cholera were reported.

**Maternity and child welfare.**—The organizer was on tour for 47 days during the quarter inspecting the various centres and urging the formation of new ones. Under the auspices of voluntary organizations three films were screened.

**Malarial control work.**—Malaria control was continued as usual in the two study stations at Nagenhalli and Hiriyyur.

The annual spleen survey of Mysore city showed that though the spleen rate continued to be low, there was a high parasite rate in several *mohallas* of the town showing a fairly high incidence of malaria in the city. The work in other places was satisfactory.

**Health education and rural health.**—At present the most important work is propaganda. Besides spleen surveys, school inspection, health exhibitions, etc., are carried on.

#### Vital statistics

**Population.**—The estimated population of the Mysore State was 6,725,754.

**Plague.**—The decline indicated in the previous quarter showed a slight setback in the quarter under report. Of 287 attacks with 147 deaths reported, Hassan district reported as many as 166 attacks with 77 deaths. Chitaldrug, Kadur and Tumkur districts were free.

**Smallpox.**—The disease showed a marked decline in the incidence, the reported figures being 438 attacks with 92 deaths against 1,085 attacks with 179 deaths in the previous quarter. More than 100 attacks were reported in Shimoga and Tumkur districts.

**Cholera.**—As compared with 42 attacks with 19 deaths reported in the previous quarter, 102 attacks with 38 deaths occurred in the quarter under report. Hassan, Kadur, Kolar and Tumkur districts were free. Chitaldrug district had 71 attacks with 27 deaths.

The increase in the incidence is indicative of the impending outbreak. The forecast, however, had been duly intimated to the authorities concerned for taking needful preventive measures in time.

#### Births and deaths reported for the previous quarter April to June 1936

**Births.**—During the quarter 29,861 births (exclusive of stillbirths) were reported giving a birth rate of 17.76 per mille of population as compared with 17.45 in the previous quarter.

**Stillbirths.**—There were 495 stillbirths reported.

**Deaths.**—As compared with 13.06 in the previous quarter the death rate during the quarter was 12.71, the reported deaths being 21,374 (exclusive of stillbirths).

**Maternal mortality.**—Five hundred and forty-six maternal deaths were reported as compared with 529 in the previous quarter. The number of reported live births and stillbirths being 29,861 and 495, respectively, the compiled maternal mortality rate during the quarter was 17.99 per 1,000 births.

**Infant mortality.**—There were 3,289 deaths of infants under one year of age, giving an infant mortality rate of 110.14 per 1,000 live births.

#### CLINICAL REPORT OF THE LADY WILLINGDON HOSPITAL, LAHORE, 1934

**History.**—In 1910 Major R. Heard, I.M.S., Professor of Midwifery, published a scheme for a separate maternity hospital in Lahore. In 1925 work was commenced on the present hospital and was completed in 1930. In

1924 a temporary maternity hospital was opened in a private bungalow. The accommodation consisted of six beds which was increased to ten. In 1930 the wards of the new hospital were occupied and the hospital was formally opened by Her Excellency Lady Willingdon in 1933. This is the first annual report published.

**Admission and deaths.**—Total number of patients admitted to hospital—1,692 made up of 500 labour cases, 390 babies, 770 gynaecological cases, abortions and ectopic pregnancies and 32 other diseases. There were 56 deaths.

**Maternal morbidity.**—Out of a total number of 500 cases, 180 (36 per cent) were morbid, made up of 91 cases (18.2 per cent) as a result of labour and 89 cases (17.8 per cent) as a result of other causes. Out of 91 morbid cases as a result of labour 27 cases were normal and 64 cases were abnormal.

**Gynaecology.**—Four hundred and fourteen patients were operated upon of which 184 were major operations with 12 deaths and 230 minor operations with 2 deaths.

**Outpatient department.**—Three thousand seven hundred and eighty-one new outpatients and 5,638 old outpatients received treatment (medicine for old outpatients is usually given for four days).

## Correspondence

### CLINICAL STUDY OF SIXTY-THREE CASES OF ORIENTAL SORE

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—With reference to the discussion on the treatment of oriental sore in the June number of the *Gazette*, I would venture to say that anyone who has had the opportunity of seeing something of Sir Henry Holland's work in Quetta would be willing to verify the claims made by Captains Goodall, Carey, Leach, Mirza and Raymond.

During a three and a half years' tour in Quetta, I also treated oriental sores according to the various methods described in the literature, but with disappointing results.

It was while trying out berberine sulphate one morning Sir Henry Holland came into my ward in the I.M.H. I told him I was finding oriental sores rather tedious and he in his characteristic way suggested that if I were really wearied of non-success I might be open to try his simple and effective treatment, namely, thoroughly scrape the sore and paint the raw area with pure liquid carbolic acid.

I had at the time a sepy with multiple sores and under a general anæsthetic I scraped and cauterized the sores dressing them with picric oil gauze. I never, if I can prevent it, allow anyone to cover a wound, clean or septic, with a dressing that will 'stick' and which on its removal will detach the fine epithelial covering at its margin. The result in this case was dramatic and I continued the treatment.

The knowledge that scraping and cauterizing these sores is the method of choice is not merely a clinical impression, it is a clinical fact arrived at by those simple trial and error methods which spell experience and is sufficient for the busy and oftentimes impatient surgeon.

It is to be regretted that the protagonists of the scrape and cauterize line of treatment have not had the patience or time to collect and publish details of results.

Yours, etc.,

M. M. CRUICKSHANK,  
LIEUTENANT-COLONEL, I.M.S.

MADRAS,  
23rd June, 1937.

[Note.—We are very grateful to Colonel Cruickshank for keeping alive the correspondence on this important subject, and for adding his own testimony.

We felt that his letter contained a slight reproof for our editorial use of the words 'clinical impression', and



we decided to take up the challenge, but we have since received a letter from Captain Raymond which we print below; Captain Raymond has made it quite clear that he does object to these words, and so we will take up his challenge instead.—Editor, I. M. G.]

Sir,—Many thanks for publishing my letter on oriental sore in Quetta in your June issue.

I am disappointed that in your footnote you call this merely 'a clinical impression.....of little weight'. I have submitted the names of colleagues for reference—and I have stated categorically that 99 per cent of hundreds of sores healed from 14 to 28 days. Also I got the A. D. M. S., Colonel Grogan, to come and see a case scraped, 2½ inches to 3 inches diameter, on the left lower jaw, so that I might show him the same case 14 days later. It was epithelialized even except for an area of about 1 cm. square and was quite healed by the next 14 days. I can go further than merely stating I got the impression these cases healed in 14 to 28 days. I can state with absolute moral truth that they did. It is a pity to put your readers off this treatment for want of a list of names and dates of cases. The disfiguring scars on the faces of patients treated for long periods medically are a sufficient appeal for something better. I do not of course claim originality for this line of treatment as my letter shows.

Failures with scraping in the past were probably due to the friable tissue not being completely removed and to not carbolicizing thoroughly afterwards. If you wish, you may publish this letter in whole or in part in your correspondence column according to your discretion.

Yours, etc.,

R. L. RAYMOND,  
CAPTAIN, I.M.S.

OFFICE OF THE CIVIL SURGEON,  
SHIMLA,  
3rd July, 1937.

[We will say at the outset that we are entirely unrepentant for our use of the words 'clinical impression'. Even if we did not feel that we could justify them—and we do—we should still be pleased that we had stimulated an interest in this important and badly-neglected subject.

Captain Raymond has submitted the names of colleagues who have had similar experience to his own. He has gone further and has shown an A. D. M. S. one, at least, of his cases, before and after treatment. We may take it therefore that these colleagues and this A. D. M. S. share his clinical impression—but it is still a 'clinical impression'.

In his letter above, he says 'I have stated categorically that 99 per cent of sores healed from 14 to 28 days'. He did not. He said 'about one in 100 sores had to be scraped a second time—never a third', which is simply a general statement.

We had no intention of putting our 'readers off this treatment for want of a list of names and dates of cases'. On the contrary our intention was rather to put them on to try this treatment, to collect accurate data, and to compare it with other forms of treatment.

If a sore is scraped and carbolic applied and this sore heals within a fortnight, it is a 'clinical fact' that that sore has healed and this fact has created a 'clinical impression' on the mind of the surgeon that the particular form of treatment is a good one, but it has established nothing beyond this. If the surgeon repeats this procedure a hundred times, conscientiously follows up each case and finds that in 99 cases the sore has completely healed within 14, or 28, days he has not only created a much stronger clinical impression but he has established the fact that in the circumstances of his experiment the treatment is a very satisfactory one. He has however done nothing to show that the treatment is better than any other form of treatment, until he collects and reports the results of treatment in exactly the same circumstances in a number of cases—

not necessarily an equally large number of cases—by other methods, and shows by statistical methods that the cure rate in one series is 'significantly' better than the cure rate in the other.

It is not names and dates that are required (few journals can find space to publish these), nor the names of A. D. M. S. or other eye witnesses, but facts and figures and the writer's assurance that he himself has observed the results—and is not accepting the unsupported statements of patients, or their failure to return for further treatment, as evidence of cure—and that he is reporting his total experience.

The results of treatment of oriental sore by the various antimony compounds have been singularly disappointing and so have other 'medical' measures; the surgical procedure adopted by Captain Raymond and his colleagues seems to have been successful. We did not complain that he reported his 'clinical impressions' nor of the words in which he reported them, but we regretted, and we still regret, that it was not possible to take what appears to have been an excellent opportunity to collect and report scientifically the results of treatment of a very large number of oriental sores by a number of different methods. Here again we are not making any personal criticism; as we realize that the exigencies of the service probably made this impossible.

—Editor, I. M. G.]

## Service Notes

### APPOINTMENTS AND TRANSFERS

COLONEL S. G. S. HAUGHTON, C.I.E., O.B.E., is appointed as Viceroy's Honorary Surgeon. Dated 20th May, 1937.

Lieutenant-Colonel J. M. R. Hennessy, Officiating Inspector-General of Civil Hospitals, C. P. and Berar, is posted as Civil Surgeon, Jubbulpore.

Lieutenant-Colonel D. H. Rai, M.C., is appointed Inspector-General of Civil Hospitals, Central Provinces.

Lieutenant-Colonel F. A. Barker, O.B.E., officiates as Inspector-General of Civil Hospitals, Punjab.

The services of Major S. C. H. Worseldine are placed temporarily at the disposal of the Government of the U. P. Dated 15th October, 1936.

The services of Major S. Smyth are placed at the disposal of the Government of the Punjab, with effect from the 21st March, 1937.

Major J. Carrey, Civil Surgeon, Jubbulpore, is transferred to Saugor.

Major B. P. Baliga, Superintendent, Midnapore Central Jail, is appointed as Superintendent of the Dum Dum Central Jail, with effect from the forenoon of the 16th July, 1937.

The services of Captain J. H. Boulton are placed temporarily at the disposal of the Government of the U. P. Dated 19th March, 1937.

Captain V. Srinivasan, Civil Surgeon, Saugor, is transferred to Bilaspur.

Captain Gerrard Kelly is posted temporarily as Professor of Medicine, Medical College, and Physician, Medical College Hospitals, Calcutta, until further orders.

The undermentioned officers are restored to the establishment:—

*Lieutenants (on probation)*  
G. R. Kerr.  
B. J. Doran.  
J. D. Munroe.  
W. J. Young.

*To be Lieutenants (on probation)*  
1st May, 1937, with seniority 1st November, 1935  
Samuel Shone.  
John Henry Walters.  
1st May, 1937, with seniority 1st May, 1936  
Charles Frederick Mayo-Smith.  
William Campbell Templeton.  
George William Palmer.



1st May, 1937, with seniority 28th October, 1936  
George Frederick James Thomas.

1st May, 1937

Gerald Christopher Arden Jackson.  
Ronald Yeldham Taylor.  
John Walter Robert Sarkies (secd.).  
Annesley Eliardo Beresford de Courcey-Wheeler (secd.).  
Neel Philip Woodgate-Jones (secd.).  
William Herbert Alfred Thorne (secd.).

#### LEAVE

Captain J. P. J. Little, Civil Surgeon, Dera Ghazi Khan, proceeded on combined leave for 2 months and 14 days, with effect from the afternoon of the 17th June, 1937.

#### PROMOTIONS

##### *Majors to be Lieutenant-Colonels*

L. K. Ledger. Dated 1st May, 1937.  
G. M. Moffat. Dated 14th May, 1937.  
(Temporary Commissions)

##### *Lieutenants to be Captains*

M. L. Gujral. Dated 19th May, 1937.  
B. N. Bhandari. Dated 21st May, 1937.  
Mohan Singh. Dated 21st May, 1937.  
S. S. Alam. Dated 22nd May, 1937.  
B. L. Kapur. Dated 22nd May, 1937.  
D. R. Sharma. Dated 23rd May, 1937.  
P. S. Bassalvi. Dated 25th May, 1937.  
G. N. Ahmadi. Dated 25th May, 1937.  
P. M. Kaul. Dated 26th May, 1937.  
A. K. Dev. Dated 31st May, 1937.  
The seniority of Lieutenant (on probation) J. D. Munroe is antedated to 1st May, 1936.

#### RELINQUISHMENT

##### *(Temporary Commission)*

Captain P. Papatla. Dated 16th May, 1937.

#### RETIREMENTS

Lieutenant-Colonel H. B. Scott, O.B.E. Dated 24th April, 1937.  
Lieutenant-Colonel A. L. Sheppard. Dated 30th April, 1937.  
Lieutenant-Colonel G. T. Burke. Dated 31st May, 1937.

## Notes

### GLUCOSE A.D.

GLUCOSE A.D. recently introduced by the well-known firm of Cow and Gate, Limited, is said to be an improved form of this valuable carbohydrate food. The rôle of glucose in dietary and certain metabolic disturbances is now of course well established. In the new glucose both vitamins A and D are present, and it is emphasized that they are derived from natural sources only.

Glucose A.D. also contains 2 per cent glycerophosphate, thus adding to its value in the treatment of calcium deficiency.

### VARICOSE VEINS

APPARENTLY the incidence of varicose veins is definitely increasing. Whether this is due to changing living conditions, or to definite changes within man's organism, would be difficult to say.

The new injection treatments, which obliterate the involved surface vessels, have been a distinct boon to both patient and physician and are extremely successful in a great majority of cases.

However, in some cases injection may need to be postponed for a time and palliative treatment instituted instead. In other cases, where injections are done, there is a good deal of pain and inflammation at and around the site of the injection. In both instances

antiphlogistine dressings are of great value. Used as hot as can be tolerated, and extending over and well beyond the site of the lesion, the results are frequently immediate and very striking.

### THE 46TH CHEMISTS' EXHIBITION, LONDON

THE Chemists' Exhibition in London is one of the most important events of the year. The 46th will be held on 20th to 24th September next in the famous Royal Albert Hall. The management, 'The British and Colonial Pharmacist', is always pleased to welcome members of the drug trade from overseas and they are admitted on presentation of business cards. Solely for the trade, it reflects the advance in the previous 12 months.

### KODAK RESEARCH MADE CORONATION NEWS-REEL FILMS POSSIBLE

For the first time in history, news-reel pictures were made of the Coronation ceremony inside Westminster Abbey. There were many who considered it would be impossible to get clear pictures in the dim light from stained glass windows, but Kodak's resourcefulness enabled this historic occasion to be recorded with complete success. Their Super X. panchromatic negative was treated by a specially devised process to give the utmost speed, and several thousand feet of this stock were used by cameramen inside the Abbey, resulting in pictures of brilliant quality. Millions of people all over the world who have seen and admired these news-reel pictures of the Coronation ceremony owe a great measure of their enjoyment to Kodak's ingenuity and research.

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## Original Articles

### OBSERVATIONS ON PROLAPSE OF THE UTERUS AND ITS MANAGEMENT IN INDIA\*

By J. CHAKRAVERTI, M.B. (Cal.), M.C.O.G.

*Associate Professor of Obstetrics and Gynaecology, Carmichael Medical College, Calcutta; Obstetrician and Gynaecologist to Sir Kedar Nath Maternity Hospital; Visiting Surgeon, Chittaranjan Seva Sadan (Calcutta); Honorary Visiting Gynaecologist, General Hospital, Howrah*

THE term prolapse of the uterus, if used in its restricted sense, means a condition in which the organ sinks below its normal level in the pelvis. The uterus, under the influence of abdominal pressure, enjoys, besides antero-posterior and lateral movements, a slight degree of downward movement. It however goes back to its former position on release of the strain. This is a physiological descent and is to be distinguished from pathological or permanent descent which is not only greater in degree but does not permit the organ going back to its original place when the pressure is removed. The descent of the uterus is generally associated with prolapse of the anterior vaginal wall and bladder (cystocele), and less commonly with the posterior vaginal wall and rectum (rectocele), and various combinations of these. Cystocele is more common than the others. Hence genital prolapse is a more accurate description of the condition than the eustomary term prolapse of the uterus.

Discussions on the structure of the pelvic organs and the mechanisms by which they are held in position have given rise to an enormous amount of literature. A brief outline of the view now held as to how the pelvic organs are supported will not be out of place.

The bony pelvis is a lozenge-shaped space bounded in front by the symphysis pubis, behind by the tip of the coccyx, and on either side by the tuber ischii, antero-laterally by the pubic rami and postero-laterally by the sacro-sciatic ligaments. This space is spanned by two layers of supporting structures which constitute the pelvic diaphragm on which the pelvic organs rest. These layers are placed one above the other and have a pelvic attachment all around. The lower layer lies practically below the level of the vagina and consists principally of the levator ani muscles with their fascial sheaths above and below, assisted by the superficial and deep perineal muscles and fascia, the packing of fat and the skin. The

upper layer lies above the level of the vagina and has a central attachment to the cervix at the level of the internal os. This layer consists of connective tissue and unstriated muscle fibres. Within this layer run nerves, lymphatics and blood vessels. The supporting layer is thicker and more condensed in places, forming so-called ligaments or special supports: anteriorly the utero-pelvic ligament, laterally the cardinal or Mackenrodt's, and posteriorly the utero-sacral ligament. The broad ligaments are only vertical expansions of the lateral and extend from the sides of the uterus to the pelvic wall.

The pelvic diaphragm is weakened by two main apertures, the rectal and urogenital. The rectal opening which lies in the posterior segment is well protected by the sudden backward bend of the anus and the decussation of the fibres of the levator ani in front of it, and it is further supported by the strong sphincter ani. In the anterior segment lies the hiatus urogenitalis which is ill-protected and is subjected to considerable stretching during the reproductive period of a woman's life. Its natural support lies in its being (1) a slit-like opening, (2) a curved canal, (3) situated well forward and out of line of direct abdominal pressure, and (4) covered by the overlying fibro-muscular plane and the body of the uterus. The urethral opening lies in the most anterior part of the hiatus and is well protected by its situation under the symphysis pubis and by the narrowness of the canal.

Besides these two supporting planes, which directly resist intra-abdominal pressure, there is another factor which plays a large part in maintaining the integrity of the pelvic support. This factor is a deflecting mechanism by means of which the intra-abdominal pressure, received on the back of the uterus in its normal position, is distributed over a large area of the pelvic supporting planes. Thus the weak anterior part of the pelvic plane is protected from the influence of intra-abdominal pressure. Further, nature like a good friend helps considerably in maintaining the uterus in its normal anteverted position. The intra-abdominal pressure is increased daily when a woman responds to the calls of nature. This function consists of two acts. The first is evacuation of the bladder which is performed with the least strain and brings the uterus, displaced by the distended bladder, back to its normal position. Then the second act, that of defaecation, begins and the intra-abdominal pressure has to be considerably increased for its satisfactory performance, thus maintaining the uterus in its anteverted position.

The factors that share in causing genital prolapse are:—

(a) Relaxation of the pelvic support. Without this factor descent of the viscera can never take place. The common cause of relaxation

\* Paper read at the clinical meeting of the British Medical Association (Calcutta Branch) on 17th April, 1936.

of the pelvic support is stretching and laceration incidental to pregnancy and labour. Hence prolapse is a disease of the parous woman, excepting on rare occasions when it occurs in nulliparous women. The labours may have been spontaneous and normal but repeated at short intervals without allowing the tissues time to regain their former tone, or one difficult labour may be quite sufficient to cause prolapse. The supports are stretched beyond recovery as when the child is forcibly drawn through an undilated cervix. The vaginal wall remains slack after such a labour and the vulval orifice gaping, especially when the underlying fibromuscular structures are lacerated.

(b) Increased intra-abdominal pressure determines the descent. The rapidity with which the prolapse advances varies a good deal in different cases. If the damage is only slight and the tissues have a fair tone, the patient may go on for some years without any trouble. Later on, as the tissue-tone diminishes, either through age or chronic diseases such as malaria, kala-azar, and other splenomegalic conditions with anæmia, the symptoms gradually appear, even with slight increase of intra-abdominal pressure. Or it may come on rather rapidly after an attack of bronchitis, pneumonia, diarrhoea, or dysentery which raises the intra-abdominal pressure quickly and tremendously.

(c) The increased weight of the uterus, particularly a top-heavy uterus and its backward displacement, constitutes another important factor in causing prolapse, especially after a recent confinement when the other supporting structures have not regained their normal condition. It interferes with the deflection mechanism and involution of supports. In fact, an enlarged and backwardly-displaced uterus is considered by many as a preliminary stage of prolapse.

Prolapse in nulliparous women is not so rare in Bengal as it was thought to be. I had the opportunity of seeing three cases last year. It is very difficult to determine the exact cause of prolapse in such women. Probably inherent weakness and enfeebled health play a large part in its causation. Often there is a history of rickets or some other constitutional disease favouring arrest of development in early life. In one of my cases, the levator ani on one side was found to be almost as thin as a type-writing ribbon. Congenital elongation of the cervix is found to be much more common than actual prolapse of the uterus in nulliparous women.

In considering the pathology, one finds hypertrophy and apparent elongation of the portio vaginalis a common condition associated with prolapse. This hypertrophy is due to laceration and chronic infection. But there are cases in which one finds elongation without any pathological change. These are probably congenital in origin as the rugæ over such an elongated area are more prominent and section presents

a picture like that found in elongation in nulliparous women. Elongation of the supravaginal portion of the cervix is found in those cases where there is a big cystocele. The upper supporting structures attached to the cervix at the level of the internal os are intact—hence the portion immediately below it, being tethered between two forces, becomes elongated. Subsequently the upper supporting structures may give way, resulting in prolapse of the uterus as well. Further, if the process of prolapse begins after the menopause when involution has already started in the uterus, one finds descent of the uterus as a whole—the organ is small, and the cervix atrophied. The rarest of all varieties of prolapse is rectocele. The reasons are obvious; the posterior wall of the pelvis being long and curved is less subjected to pressure than the anterior both in degree and duration during labour. Besides, Douglas' pouch comes low down between the vagina and rectum and beyond this there is considerable loose areolar tissue between these two viscera.

Various pathological changes, *e.g.*, pigmentation, cornification and ulceration, are noticed in the prolapsed part but it is curious that malignant change is hardly ever found. I have had a case of primary carcinoma of the vagina following prolapse in the Chittaranjan Seva Sadan. The woman was over 60 years old—the cervix was healthy. There was no history of pessary treatment and the prolapse was of 15 years' standing. It was wart-like in appearance to the naked eye. Professor Beckwith-Whitehouse mentions a single case which occurred in Birmingham. Smith Graves and Pemberton suggest that this immunity is due to good drainage, which naturally prevents the retention of chemically changed and irritating secretions.

Prolapse is one of the commonest gynaecological affections found in Bengal. It is impossible to state correctly the real incidence of the disease because all patients suffering from the condition do not always seek medical advice or apply for treatment. This fact can be best proved by the presence of the condition in a fairly good number of in-patient women on the labour table. When such patients are interrogated, they either say that they did not seek medical aid because the condition did not bother them sufficiently, or they are quite ignorant of the existence of the prolapse. In the out-patient department of any gynaecological hospital in Bengal, prolapse of different varieties and degrees form, next to inflammatory conditions of the pelvis, the bulk of the cases. The same applies to the indoor cases. In the year 1935, in the Carmichael Medical College Hospital, out of 366 operations 84 were for prolapse. Of the 152 patients operated on for gynaecological troubles, 44 of them suffered from prolapse. Roughly speaking, one out of every four cases in gynaecology was a prolapse.

The prevalence of prolapse in Bengal may be ascribed to:—

- (1) Early marriage and conception at an early age. Fortunately this custom is now passing away.
- (2) Repeated pregnancies with a very short interval for recouping health.
- (3) Want of nourishing and vitamin-rich food for the nursing mother, and prolonged period of lactation.
- (4) Inefficient management of labour and puerperium.
- (5) Too early resumption of household work after confinement.
- (6) Too much strain brought on by frequent attacks of cough or straining, particularly in dysentery which is very common in Bengal.
- (7) Undermining of health by chronic malaria, kala-azar and other types of splenomegaly which are common among the middle and poor class people in the villages.

The diagnosis presents no difficulty. In fact, the patient herself often diagnoses her condition before she comes for medical help. One easily finds prolapse of different varieties and degrees in the out-patient department of our gynaecological hospitals, ranging from the worst cases with the patient carrying the uterus between her thighs for years together before seeking help, to the very moderate ones. The better-class, intelligent patient, however, may see her doctor for symptoms of dragging pain in the back and pelvis, made worse on walking and straining during the day and relieved by rest at night. One condition from which these symptoms are to be diagnosed is orthopaedic strain or subluxation of the sacro-iliac and lumbo-sacral joints. I have had two such cases operated on for prolapse but both patients came back some months later, without any relief of the backache, though the operations were successful. They gave a history of satisfactory movement of the bowels. By subsequent attention to the joints both patients were relieved of the pain. Now it is my practice to examine the pelvic joints of every case of prolapse. In a doubtful case, before I decide on any operative treatment for prolapse, I always put in a ring pessary and ask the patient to see me after a week. In this way the diagnosis is made easier. At the same time, it is possible for both conditions to coexist in the same patient, who is usually an elderly woman with a big family.

Again, patients may present themselves with symptoms of urinary derangement, *viz.*, frequency or urgency of micturition and exertion or stress-incontinence of Victor Bonney (wetting her clothes on coughing and laughing). The prolapse which is the underlying factor in such cases may be overlooked. Hence the importance of thoroughly examining the pelvis in

parous women suffering from such important urinary troubles.

**Prevention:** Before discussing the treatment of prolapse, I want to lay particular stress on its prevention. Prolapse is one of those gynaecological conditions which are the outcome of bad midwifery. A good proportion can be easily prevented. The object of modern midwifery is not merely to confine a pregnant woman but to make every labour ease as normal as possible and to watch and prevent the onset of any complication during pregnancy and puerperium, so that pre-pregnant local and general conditions may return as far as practicable. With this object in view, antenatal and postnatal clinics have been opened in nearly every part of the civilized world.

The following are the methods for the prevention of prolapse:—

(a) During pregnancy the general health of the patient should be maintained at the highest possible level.

(b) During labour, undue haste in terminating the second stage must be avoided, application of forceps through an undilated cervix is a common temptation in private practice. At the same time the second stage must not be prolonged unduly. Any damage done to the supporting structures must be efficiently repaired.

(c) During the puerperium, the lying-in period must be prolonged and sufficient rest (not necessarily in bed) must be encouraged. With this object in view, I always recommend at least a ten-day stay in the hospital for every normal labour case. The importance of this point cannot be overestimated. The class of patients who subsequently develop prolapse of the genitals is usually poor. A day's rest in the hospital during the puerperium with properly regulated food is equal to a week's rest for her at home. Lastly, the patients should be asked not to resume work too early. They should also be advised to have themselves examined once more at the end of the third week. This practice will not only cure many subinvolved and retroverted conditions which predispose to prolapse, but will prevent the subsequent development of many gynaecological affections.

I know of two cases of prolapse following such simple operations as dilatation and curetting for dysmenorrhœa and sterility in young nulliparæ. Probably congenital weakness of the supporting structures was the underlying factor, but pulling on the cervix up to the level of the vulva was the exciting cause. Hence the young practitioner should always be careful in putting traction on the cervix during such operations.

The treatment of prolapse may be (1) non-operative, mechanical support by pessary, or (2) operative, plastic repair of the damaged structures of the pelvic floor.

Operative treatment in general has yielded satisfactory results and with very little risk.

As a consequence, operation has replaced pessary treatment. Even then, treatment by pessary has a place, (i) as a temporary measure before operation when the patient's general or local condition does not permit of immediate surgical interference, (ii) during pregnancy, and (iii) in old age or when operation is refused. Operative treatment for prolapse in a woman over 60 years in Bengal should not be undertaken without due consideration of all other factors.

Again, for a mild degree of prolapse, particularly after recent confinement in a young girl, I always treat the patient with a pessary and recommend a change to the country, a hill station or the seaside for a couple of months, with tonic medication. I feel satisfied that three out of four cases are cured in this way and in the remainder the further progress of the disease is arrested. I would suggest that education of the perineal muscles by alternate contraction and relaxation regularly for some minutes twice daily in the knee-chest position may further help in bringing back the tone of the supporting structures.

The large number of pessaries on the market, with their many ingenious modifications of shape, perplexes not only the student during examinations but also the practitioner in selecting the right type suitable for a particular case. For practical purposes, the ring pessary is the one most useful for stretching the vaginal vault and thus giving support to the viscera. As a temporary measure, I always use the rubber and spring pessary. But for permanent use vulcanite or celluloid are the best, because they cause least damage to the vaginal mucous membrane, in the event of the patient neglecting to keep herself clean. Besides, they do not perish so quickly as the rubber ones in our tropical climate. It is only on rare occasions when the retentive capacity of the vagina absolutely disappears that such uncommon instruments as Napier's or Aveling's pessaries are required.

A large number of operations has been devised for the various forms of prolapse. Different clinics adopt different operations with approximately equal results. The confusing multiplicity of operations for prolapse often misleads students of gynaecology and young specialists. The history of the development of these operations has given rise to volumes of literature. The operative methods employed vary from simple denudation of the mucous membrane of the vagina with approximation of the edges, to the most extensive dissection of the pelvic cellular structures with invasion of the peritoneal cavity. The principle underlying every operation is reconstruction of the damaged structures constituting the pelvic floor. Overstretched or torn muscles with their fasciæ and connective tissues are reefed or stitched to their old attachments, for as Kelly says

'muscles will always work'. If the attenuated muscles with an adequate fascial support are properly shortened and given a fixed point to work from, they will resume their functions.

In order to simplify the choice of operative methods the American gynaecologists classify cases into two groups:—

(1) Those in whom the question of future pregnancy is a consideration, *i.e.*, operation in child-bearing women.

(2) Those in whom the question of pregnancy is eliminated, or operation in women who have attained the menopause or who do not want any more children. Under each group they recommend a large number of operations. I do not think that for practical purposes we need such an extensive classification. From the surgical point of view, I put prolapse cases in the following groups:—

- I. Simple cystocele or cystocele with a mild degree of prolapse.
- II. Cystocele and prolapse of the uterus with hypertrophy and elongation of cervix, a common condition.
- III. Cystocele, prolapse of the uterus and rectocele.
- IV. Cystocele with prolapse of the small involuted uterus in old women.

As prolapse in Bengal is common between the ages of 20 and 30 years, preservation of the reproductive function should always be aimed at.

#### Group I

Anterior colporrhaphy yields uniformly satisfactory results in nearly every case. To be effective, anterior colporrhaphy must be thorough. The bladder should be dissected off, pushed up as high as possible, and the pubo-cervical fascia not only brought together, but given a higher attachment to the cervix—so-called elevation of the ligament. Every anterior colporrhaphy must be followed by perineorrhaphy in order to give support to it, otherwise the operation will be a failure.

#### Group II

Fothergill's or better Donald-Fothergill's is the operation of choice, as a large percentage of prolapses in Bengal occurs in young girls. The alternative operation is the inter- or transposition operation of Watkins, the ideal cases being those who have passed the menopause and in whom the uterus is fairly big; for Watkins in young women, the reproductive function has always to be sacrificed.

The advantages of Fothergill's operation are (1) the reproductive function is not interfered with, a fact of considerable importance in young women, (2) the anatomical relations are maintained, and (3) it yields satisfactory results in the majority of cases. In nearly every British clinic it has yielded 90 per cent success. The only drawback is that the condition may recur in the event of subsequent pregnancies. This however



can be obviated if patients are delivered in better surroundings, such as in a hospital or nursing home, or are attended by doctors in their own homes. The second stage should not be unduly prolonged and timely mediolateral episiotomy should be done to take away the strain on the operated area. Some say that stenosis of the cervix is sometimes a complication following this operation, resulting in obstruction in subsequent labour, but stenosis only results if the stitches slough and healing takes place by granulation; so it is not a defect of the operation but of the technique and of a complication.

In the absence of pregnancy, if the operation fails either due to congenital or acquired weakness of the supporting structures, I employ the uterus as a sling or ligament to pull the vaginal vault abdominally, that is ventral fixation. This combined operation, 'vaginal and abdominal', is often called the 'round trip operation'.

The defects of Watkins' operation are (1) the pathological condition is rectified at the expense of the reproductive function if the patient is young, (2) the anatomical relations and position of the uterus are altered—the fundus looking downwards, (3) the uterus is at a mechanical disadvantage in expelling the menstrual flow, and (4) the organ, displaced from the peritoneal cavity and buried in the connective tissue, may become the seat of a tumour, benign or malignant. In such an event, subsequent operation, either vaginal or abdominal, on the Watkinized uterus will be extremely difficult. In one of my cases the fundus maintained its position and prevented the cystocele but the cervix became elongated and prolapsed outside the introitus, that is the uterus rotated on a transverse axis passing through the region of the cornua. So the question arises as to whether amputation of the cervix should be done in every case of Watkins. If so, then the operation becomes more difficult.

Ward Mayo's operation also yields satisfactory results in this group of cases. My practical experience is not very wide but I think it is not always possible to estimate the strength and support that will be derived from the broad ligament stumps before hysterectomy is performed. If this operation fails it would result in an enterocele which is worse than genital prolapse. The immediate result appears very satisfactory when the patients leave the hospital.

### Group III

The operations for this group of cases are the same as for group II followed by an extensive posterior colpoperineorrhaphy right up to the extreme vaginal vault, if necessary with plication of the anterior wall of the rectum. The size and shape of the vaginal mucous membranes to be denuded will depend upon the degree of rectocele present.

### Group IV

Here not only the uterus but all the structures of the pelvis have undergone involuntary changes—and any reconstructive operation may yield disappointing results. I always perform a modified Le Fort's operation. It differs from the original in that instead of strips of mucous membrane being taken from the anterior and posterior vaginal walls, the mucous membrane is split vertically in the middle line in either wall and dissected on either side leaving a broad raw area. The flap on the upper is stitched with that on the lower of the same side by interrupted catgut sutures. The same process is repeated symmetrically on the other side. The result is that a broad area of union between the upper and lower vaginal walls is produced obstructing the prolapse and at the same time leaving a tubular passage on either side for the exit of any internal or cervical discharge.

The secret underlying the success of any one of these plastic operations lies in the following points:—

(1) Preoperative treatment which relieves congestion and œdema, (2) extensive dissection, (3) close apposition of the supporting structures, (4) exaggerated denudation of the mucous membrane—experience and not book knowledge will teach the amount to be denuded in each case, (5) accurate apposition of the edges, and (6) post-operative rest and care—recent and remote. The difference in results in the hands of different surgeons is due more to individual technique than to the actual operation.

Lastly, prolapse of congenital origin, though fortunately rare, is very difficult to treat. It is in this group we notice prolapse in nulliparous women and in rare cases in virgins with intact hymens. In these cases, the supporting tissues on one or both sides may be absent or ill-developed. Naturally one cannot lay down any rule as to the nature of the operation to be adopted in these cases. Every case should be dealt with on its own merits.

It will not be out of place to mention here some of the complications of labour in neglected and untreated cases of prolapse, which are not rare in this country; moderate degrees are by no means uncommon. The main difficulty met with in these cases is very slow and, up to the last, incomplete dilatation of the cervix. The part just above the prolapsed anterior lip is pressed upon by the foetal head against the posterior surface of the symphysis pubis and as a result the cervix becomes œdematous and congested, bleeds during labour and ulcerates and sloughs during the puerperium. In moderate cases fomentation, hot douches and pushing up of the anterior lip of the cervix over the presenting part with each pain usually overcome the difficulty. The worst case was one

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## RECURRENT SWELLING OF THE PAROTID GLANDS WITH THE REPORT OF A CASE

By MIN SEIN, M.B. (Cal.), M.R.C.P. (Lond.)

CAPTAIN, I.M.S.

Burma

DURING the last few years attention has become focussed on the uncommon condition of recurrent swelling of the parotid glands. An annotation in the *Lancet* (1936) fairly well summarized the knowledge of the condition up to date. Recurrent parotitis due to pyogenic causes have been described fully by Payne (1931, 1933) and Pyrah (1933). Of the non-pyogenic type Bruce Pearson (1935) collected eleven cases, the majority of whom were children under nine years of age, and he made a suggestion that the ætiological factor in these cases is allergic in nature. Meyer (1934) described a case coming under the latter category where the allergic state was regarded as being familial and hereditary in origin. The evidence of allergy was deduced from the presence of its manifestations, such as hay fever, urticaria, asthma, eczema, angioneurotic oedema, etc., in the patient himself, or amongst other members

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I saw in the Eden Hospital in 1932. The patient, pregnant 8½ months, was admitted with slight pain and with prolapse of the cervix, which was lying outside the vulva, thick, oedematous, congested and enlarged to the size of a baby's buttock. In fact it was strangulated. Fomentation did not improve the condition and it could not be reduced. The cervix was only one finger dilated. Colonel V. B. Green-Armytage performed lower uterine Cæsarean section in this case and drained the uterine cavity *per vaginam* with glycerine and a rubber tube. The patient recovered though the puerperium was very stormy, which was only to be expected.

In conclusion, considerable importance should be attached to the prevention of prolapse. Every labour case in maternity hospitals should be advised to attend the post-natal clinics on the 20th day and the importance of this should be clearly impressed on her. In private houses the patient should be similarly seen on the 20th day.

Abdominal operation alone has got no place in the treatment of prolapse. A plastic operation (Fothergill) is the operation of choice, particularly in Bengal where prolapse is common in young patients. It restores the damaged structures without interfering with the reproductive function. The immediate result is very satisfactory in nearly all cases. As regards the remote result, one has to wait for years before any opinion can be passed as to the effect of the operation on subsequent labours.

of the patient's family. Some years ago Burton-Fanning (1925) recorded a case in which the parotid swelling occurred in association with sneezing, the attacks were relieved by the hypodermic injection of three minims of adrenalin. No similar case appears to have been published in India or Burma; hence it seems appropriate to draw the attention of the profession to this interesting condition by the publication of the following case report and a brief consideration of the common clinical features of the condition:—

### Case record

B. K., aged 2½ years, was brought to me by his mother on 15th October, 1936, on account of intermittent painful swelling of the right side of the face in the region of the parotid gland.

*History of the case.*—The first attack occurred in August 1935 when the child was only about ten months old. The child was playing at the time and the mother's attention was drawn to it by a sudden outburst of crying for no apparent reason. The mother discovered the child's face to be swollen up on the right side—the area involved being in front of and just below the ear. The swelling was tender and hot and skin over it was of purplish hue. The attack subsided within a few minutes and the parotid area assumed a normal appearance soon afterwards. By the time the child was taken to a doctor no trace of the swelling remained. The attack recurred in the evening and subsided without any treatment. During the next few days the act of suckling or chewing brought on attacks on two or three occasions.

The second attack occurred in December and lasted for a week and was accompanied by fever. Treatment by belladonna pigment did not seem to give any benefit but the attack stopped spontaneously as before, without leaving any local evidence. A third attack occurred in March 1936, lasted for three days and was unaccompanied by fever. There was a long period of remission till the present attack, which was induced by attempting to chew some food. This lasted for three days and was not accompanied by fever.

*Family history.*—The father, a Mohammedan, had married twice. By his first marriage he had a grown-up son and daughter. The obstetrical history of the patient's mother, an Anglo-Indian, was as follows: son aged 11, son aged 9, daughter died when 11 months old, abortion at 1½ months, stillborn female child, the patient, female child, aged 13 months. Both the father and mother were healthy and did not suffer from any allergic disease. The patient's maternal grandfather and aunt suffered from asthma and his step-sister also suffered from the same complaint. The other members of the family were healthy. The patient was a full-term baby and had developed normally to date.

*Physical examination.*—A well-nourished boy with a clear and delicate complexion. He had 10/10 milk teeth. The swelling in the parotid region was just noticeable; the whole area seemed fuller and was slightly discoloured and brawny. There was slight tenderness on pressure and the skin felt somewhat indurated. There was no nasal catarrh; the mouth and throat and the openings of the parotid ducts appeared normal. A specimen of clear saliva obtained after expression of the parotid gland contained epithelial cells but no pus. The reaction of the saliva on both sides was strongly acid so that a blue litmus paper applied to opening of the parotid ducts turned red. No calculus was discovered on x-ray examination. Appropriate treatment was advised to the mother.

*Subsequent history.*—There was a further attack in October in which both glands were involved, not accompanied by any rise of temperature. The child was seen again on 6th November just after an attack involving the left parotid gland. There was no change in the general or local condition of the patient.

*Commentary*

The above case could be placed under any of the three categories: (1) allergic, (2) spasmodic, and (3) catarrhal, but the family history is suggestive of it being allergic in nature. The possibility of a congenital abnormality of the duct or gland cannot be excluded, and as the original attack occurred soon after the child was weaned it might be susceptible to some foodstuffs. The tendency of the saliva to acid reaction is of interest and has been noted by other observers. The features in this case correspond, in the main, to the cases reported by Pearson, Payne and Pyrah.

*Symptoms and signs.*—The onset is acute or subacute and may be brought on by an act which stimulates the secretion of saliva, or it may occur independently of the taking of food. The cases reported under the allergic group were mostly young children whereas the infective or pyogenic cases were in adults. During the attack the gland becomes hot, tender and painful and may become dusky from venous obstruction. A characteristic feature is the remarkable freedom from inconvenience, and absence of definite signs of gland involvement during remissions, which may be of months' or weeks' duration. Thus the act of chewing food which might bring on an attack during the period of exacerbation would have no effect during this stage. In subacute and chronic cases a certain degree of dilatation of the terminal ducts or acini may be seen and later on gross dilatation of the main duct and its branches may occur. This can be demonstrated by radiological examination after injection of lipiodol, the technique of which has been well described by Pyrah and Allison (1931). This complication is more common in infective or pyogenic cases and is attributable to the weakening of the ducts similar to that which occurs in bronchiectasis. Frank suppuration and abscess formation are extremely rare. The signs of infection are intensification of the signs and symptoms and the appearance of signs of inflammation at the orifice of Stenson's duct.

*Ætiology.*—Payne regards all forms of acute and subacute pyogenic parotitis as due to ascending infection secondary to oral sepsis. Pyrah also believes that oral infection is the chief ætiological factor. In their opinion the catarrh of the parotid duct results in obstruction and retention of saliva and subacute parotitis. Bacterial infection renders this condition worse and a vicious circle is formed. Subsequently the intermittent obstruction results in duct dilatation. In one case Pyrah thought that there was a congenital kink at the orifice of Stenson's duct. Whilst conceding that infection plays an important part in certain cases of recurrent parotitis, Pearson believes that there is a group of cases where the allergic manifestations are so strong as to constitute an important ætiological factor. Taking the

cue from the resemblance of the parotid gland and its duct to the kidney and the ureter one is safe in saying that when further experience is gained on the subject of recurrent swelling of the parotid glands more definite ætiological factors will be discovered than have been suggested so far.

*Prognosis.*—The course of the disease in all types is a mild one. Attacks may become more frequent and both sides may be involved as in the case on record, on the other hand both glands may be affected from the outset. The prognosis appears to be better in the allergic group unless infection sets in and transforms the case into the infective or pyogenic type. The average duration of the disease in the series of nineteen cases described by Payne was nine years and Pearson records a case in his series, who at the age of twenty-six had been suffering from the complaint for nineteen years without evidence of infection.

*Treatment.*—In the allergic cases the sensitizing food will have to be sought for and avoided, and the general treatment will in the main be that of the allergic state. In all types it is important to keep the mouth and nasopharynx clear of sepsis. Local treatment consists of light massage over the gland and the duct in the direction of its orifice, to prevent stasis of the secretion, especially after taking food. An acid drink such as lime juice or orange juice may be taken to stimulate the free flow of saliva. In Burton-Fanning's case the attack was associated with dryness of the mouth and sneezing, which disappeared when the attack passed off. During the attack dry heat applications in the shape of a salt pack will usually give some relief. A salt pack can be prepared by heating salt in a pan and tying it up tightly in a piece of cloth or making the bundle first and heating it by placing it against a hot brick. This is pressed against the swollen gland. Adrenalin has been used successfully in the allergic type and ephedrine might be tried. When infection and duct dilatation have resulted in much stasis of secretion with residual swelling of the gland free drainage might be achieved by slitting the orifice open. More drastic operative measures will not be necessary.

*Summary*

1. A case of recurrent swelling of parotid glands is reported.
2. This case is believed to be allergic in nature of the type described by Bruce Pearson.
3. A brief description is given of the general features of recurrent parotid swellings similar to those in the case described.
4. The present case appears to be the youngest on record.

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## A MALIGNANT CYSTIC HÆMANGIO-BLASTOMA OF THE CEREBELLUM

By R. V. MORRISON, M.D., F.R.C.P. (Edin.)  
LIEUTENANT-COLONEL, I.M.S.

*Professor of Medicine, University of Rangoon, and  
First Physician, General Hospital, Rangoon*  
and

P. G. GOLLERKERI, M.D.

*Officiating Professor of Pathology, University of  
Rangoon*

CUSHING AND BAILEY (1928), in their excellent monograph on blood vessel tumours of the brain, describe several neoplasms under the general term cerebellar hæmangio-blastomas. These, in the cases cited by them, are shown to arise generally in the middle-line of the cerebellum and in the neighbourhood of the fourth ventricle. Primary tumours of the brain, when compared to those of other situations, are comparatively rare, and hæmangio-blastomas rarer still. The proportion of hæmangiomas to other intra-cranial tumours is said to be as 2 to 100. The case we describe below would be worth recording if only because of its rarity.

*Case.*—The patient was a European male of 48 years, who presented himself on the 5th January, 1937, at the Rangoon General Hospital with symptoms of acute gastritis. This condition seems to have been precipitated by a dysenteric bout a fortnight previously. Following this he lost all appetite for food, with attacks of nausea and bilious vomiting, especially in the mornings. At the time of admission, he was unable to take solid food, as almost immediately afterwards he had a feeling of gastric discomfort which was much worse if he lay on the left side. In other respects, the general condition of the patient, such as nutrition, build, etc., could be considered good. In the hospital the attacks of vomiting continued two to three times a day and, on the fourth day of admission, he developed a tinge of jaundice. He progressed in this way for nearly three weeks steadily losing weight. Subjective nervous symptoms became gradually more pronounced in the meantime. A thorough examination of the nervous system was made with the following findings:—

*Headache.*—Chiefly on the left side, started about two weeks before he came to the hospital: occurred in spasms, each spasm lasting about half an hour. Turning on the left side would either bring on a spasm, or accentuate an existing one.

*Giddiness.*—Very severe. He was unable to walk on account of this. When he lay in bed, no giddiness was felt.

*Vomiting.*—At the beginning he vomited frequently and even fluids could not be retained. Latterly, the attacks became fewer, mostly in the mornings when he brought up a little bilious matter. Nausea was complained of at other times, though he had no actual vomiting. Change of posture did not induce vomiting.

*Visual disturbances.*—He complained of dimness of vision during the attacks of headache. Had been using

glasses for a very long time, which were changed only five months ago. There was no diplopia.

*Bladder and rectum.*—Functions normal.

*General.*—No pain or paraesthesia; no disturbances of consciousness, slept fairly well; attention, perception, powers of orientation in time and space were normal. Reasoning power quite good. Memory for past and recent events somewhat impaired. There were no delusions, illusions or hallucinations. Volitional functions fairly good.

*Reflexes.*—Pupillary—normal; corneal—normal; abdominal—normal; plantar—flexor; tendon reflexes—normal. Muscular power—good.

There was no inco-ordination, tremors or nystagmus. Epicritic and protopathic sense unimpaired. Muscle and joint sense appeared normal.

The fundi were examined and found normal.

*Other examinations.*—A complete blood picture did not show much deviation from the normal. An x-ray of the stomach and alimentary canal revealed only hyper-tonicity of the stomach with rapid emptying. The icterus index was 17, Wassermann reaction negative. There was no rise of temperature at any stage of the illness nor was there any abnormality in the rhythm or rate of the heart.

The patient went steadily downhill, refusing food, and vomiting the little he was forced to take. This was about three weeks after admission. His whole attitude became one of 'refusal to do anything or to take anything, or to co-operate with anyone'.

This mental condition became sufficiently pronounced for an alienist to be called in who made a diagnosis of toxic insanity. Other consultants suggested dementia præcox. In the later stages he passed urine in bed and appeared to do this deliberately. He was removed from the hospital at this stage and died about a week later in a state of deep coma, which developed about 10 hours before death.

*Post-mortem examination.*—Rigor mortis was present all over. There was well-marked post-mortem lividity over the back and back of the neck.

On opening the thorax, a superficial examination failed to reveal any notable abnormality. The feel of the lungs was normal. The pleural and pericardial sacs contained the usual amount of clear fluid. The œsophagus and upper air passages showed no gross abnormality. Directly opposite and in front of the tracheal bifurcation (middle mediastinum) was found a mass about the size of a large duck's egg. A part of this growth was adherent to the right lung just above its root. It did not appear to press on any other important structures in the vicinity such as the aortic arch or its branches, the vena cava, the œsophagus or even the trachea behind it. On cutting open the mass, it was found similar in appearance to a group of tuberculous glands with some softening (caseous?) and dark bluish-black pigmentation in streaks. A small discrete nodule, the size of an unshelled almond, was also found in the right lung about an inch from its root. The rest of the right lung and the whole of the left showed no notable abnormality. The heart and aorta showed no gross change, beyond a few patches of early atheroma.

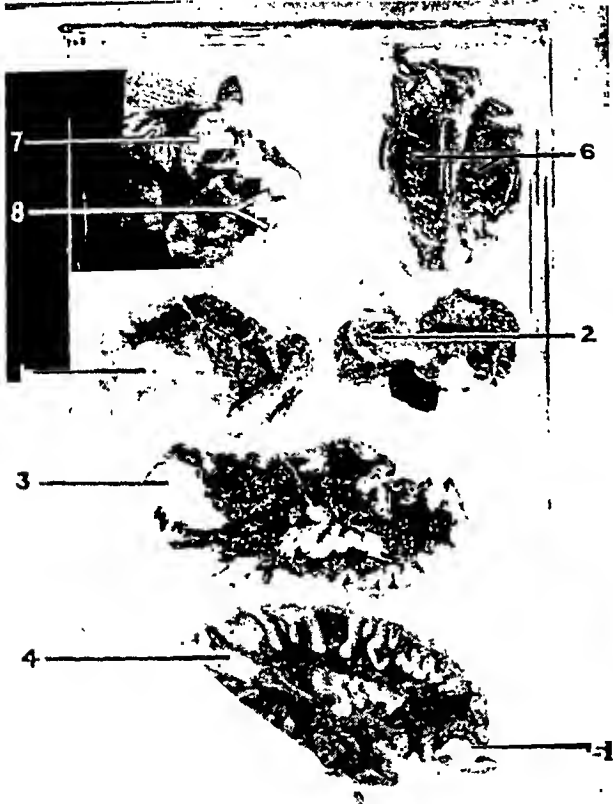
*The alimentary tract.*—The stomach showed a congested mucous membrane and contained a small amount of bile-stained watery fluid. The colon showed discrete subacute amebic ulcers, more or less throughout its length. The liver, spleen and kidneys showed little beyond extreme congestion.

*The brain.*—On opening the cranium and reflecting the dura mater, the contour of the brain did not present any obvious abnormality. After the usual incisions in the tentorium cerebelli the whole brain was removed together with a part of the cervical cord. A surface examination of the cerebral hemispheres showed a slight depression in the cortex over the frontal and occipital poles of the right side. A longitudinal-section of this hemisphere was next made and revealed two cystic cavities about half an inch in diameter lying

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beneath the depressions described above. The brain matter was softened around these cysts, giving an irregular ragged appearance to the walls. The appearance of the cysts was not unlike that of simple softening and liquefaction of a recent cerebral infarction. The left hemisphere failed to show any abnormality externally or on section. The cerebellum was next opened along its prominent border after noting a boggy soft feel over the right lobe. About two-thirds of this lobe was occupied by a cyst not unlike those already found in the cerebrum, with the difference that a tangled network of pink capillary blood vessels constituted its lining. This cyst and its capillaries could be traced to the region of the roof of the fourth ventricle in the



- 1 and 2. Primary tumour in the cerebellum—malignant cystic hæmangio-blastoma.  
 3, 4 and 5. Secondary cystic tumour deposits in the frontal and occipital poles of the right cerebral hemisphere.  
 6. The mediastinal deposit—opposite the tracheal bifurcation.  
 7 and 8. Deposits in the lung.

middle line. The left lobe of the cerebellum was normal both externally and internally.

In the case of the cerebrum, the lateral and the third ventricles were defined throughout and no communication could be detected between the cysts in the right lobe and the ventricular cavities. The choroid plexus was of normal appearance.

The stomach with its contents, a piece of the liver, spleen and one kidney were examined by the chemical examiner for poisons with negative result.

*Histological examination.*—Microscopic sections were made of the tissues from the wall of one of the cerebral cysts, the cerebellar cyst, the mass in the mediastinum, the deposit (?) in the lung, from the kidney, spleen and liver. Mayers' hæmalum and eosin were used in staining these.

*The cerebellar cyst wall.*—The histological structure was that of a highly cellular and vascular tumour. The cells were large, more or less fusiform with dark-staining plump nuclei. There was very little cytoplasm, nor could any fibrillar structure be made out between the cells. The number of blood channels was striking. Some of these were well formed, others thin-walled and irregular. But the lumen of the majority was circular.



Fig. 1.—Malignant cystic hæmangio-blastoma of the cerebellum. (Low power.)

Most of the tumour capillaries contained intact blood cells but no tumour cells. The association of numerous vessels with a highly cellular tumour pointed to its being some type of hæmangio-blastoma. The only other notable point in these sections was the great tendency to necrosis of tumour areas distant from the

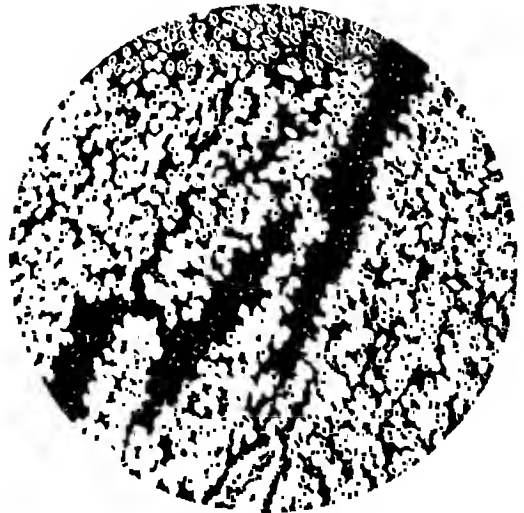


Fig. 2.—Cell structure of the tumour. (High power.)

blood vessels. Some of the vessels appeared to be occluded by a lighter-staining endothelial type of tissue consisting of hyalinized pink-staining masses. Evidence of tumour cell mitoses was abundant in the tumour. Externally, under the pia, there was a marked inflammatory reaction in the form of small round-celled

infiltration. Between this band and the tumour lining was a belt of what appeared to be normal cerebellar cortex.

*The cerebral cyst wall.*—The tumour structure here was generally the same, including the association of cellular growth and vascular channels. Incidentally, the tumour in these sections could be studied more definitely as to the shape and staining characteristics of the neoplastic cells and they confirmed the findings of the cerebellar sections.

*The mediastinal mass and nodule in the right lung.*—The cell structure was exactly the same as in the sections described above. Vascular channels however were fewer than those in the brain, but the tendency to cell degeneration and necrosis was more marked though no obvious cyst-formation could be made out. A pseudo-rosette formation of the neoplastic cells could be discerned at points in the sections. This mediastinal mass had a well-marked fibrous capsule and showed no infiltration of adjacent structures. No lymphatic tissue was discernible.

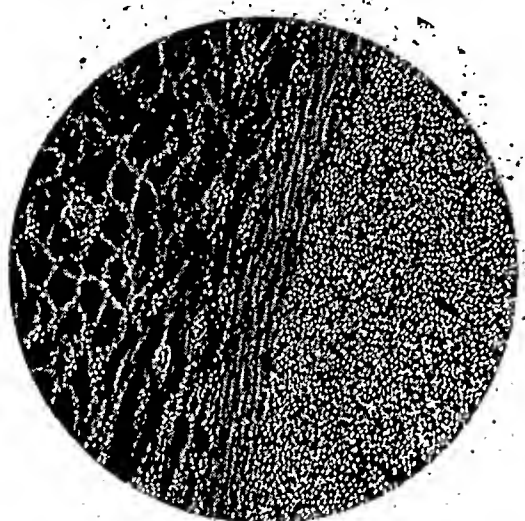


Fig. 3.—Metastatic nodule in the lung.  
(Malignant cystic hæmangio-blastoma  
of cerebellum.) (Low power.)

*The liver, kidney and spleen.*—Microscopically extreme congestion with extravasation and infiltration of blood into the tissue spaces was the only noticeable feature in these organs. No neoplastic tissue could be detected either macroscopically or microscopically.

### Diagnosis

From the clinical and post-mortem examination, a diagnosis of malignant hæmangio-blastoma of the cerebellum with metastases in the cerebrum, lung and mediastinum is arrived at. The histological appearances point to its being labelled as one of the sarcomata (spindle-cell type), and its possible origin from the cerebellar medulla would suggest the term angio-glio-sarcoma. The peculiar endothelial likeness of the cells at first suggested an endothelioma turned malignant. As the common termination of an endothelioma inside the cranium is a slow-growing solid sand-tumour (psammoma), and as its origin is from the meninges rather than the brain substance, such a diagnosis did not seem justifiable. A close

study of similar tumours with regard to site, symptomatology and pathology in the following discussion points to these tumours being of the group of medullo-blastoma mixed with certain features of an angioma.

### Discussion

*Age.*—The average age of cerebellar hæmangio-blastomas is about 34 years and is much higher than the average age for cerebellar gliomas which are more common in childhood. Again the gliomas are slower in growth (particularly the astrocytomas).

*Symptomatology.*—The first symptom of a cerebellar tumour is variously described as sub-occipital tenderness, discomfort, stiffness or headache; vomiting usually occurs late in the course of the disease; later still is the development of true cerebellar symptoms such as unsteadiness and visual disturbances secondary to hydrocephalus. Chronologically then, vomiting occurs late, though in the cerebellar tumours of childhood vomiting is not only the first but often the only symptom till the later stages. Vomiting is really a localizing symptom, as surgical manipulation of the portion of the cerebellum which directly roofs the fourth ventricle and of the cerebellar tonsils is likely to provoke vomiting in patients under local anaesthesia only.

*Diagnostic considerations.*—Hæmangiomas of the cerebellum are often associated with a retinal angioma, and together with obscure cerebellar symptoms, its detection on ophthalmoscopic examination in the retinal periphery of the papilla may help to clear up the diagnosis. But unfortunately attention is so often focussed on the papilla for oedema or atrophy that a peripheral angiomatous condition is likely to be missed. From neurological signs alone, the presence of a cerebellar tumour should in most cases offer no difficulty, but the pre-operative pathological diagnosis of the nature of the tumour is far from easy. In this case the rarity of an angioblastoma of the cerebellum and the paucity of physical signs make diagnosis a virtual impossibility.

*Pathology.*—It has been observed that cerebellar hæmangio-blastomas, like cerebellar gliomas, may occur either as largely cystic, intermediary or solid tumours. The tendency in gliomatous tumours of the brain to undergo degenerative changes with almost complete disappearance of the tumour substance and replacement by a cyst were originally stressed by Sir Victor Horsely. It is not clear as to why some tumours become cystic and others solid. Lindau, in describing the pathogenesis, suggested that an exudative function of the neoplastic cells, rather than the vascularity of the neoplasm, accounted for cyst-formation, because it is as common in relatively

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# MALARIA AND ITS TREATMENT BY THE SYNTHETIC REMEDIES: ATEBRIN AND PLASMOCHIN

By R. V. N. NAYUDU, L.R.C.P., M.R.C.S., D.T.M.  
Senior Assistant Surgeon in charge, Railway Hospital,  
Erode

I GIVE below a record of 187 cases treated as in-patients at the South Indian Railway Hospital, Erode, since September 1934. The patients were all adult male Indians, except four who were Anglo-Indians. Diagnosis was made by microscopical examination of the blood and the patients have been kept under observation from date of discharge to the present date.

The total number of cases treated was 187. One hundred and sixty-two of them were new admissions and 25 were admissions of the same patients for relapses at different dates. The

(Continued from previous page)

non-vascular gliomas as in the highly vascular angiomas.

**Histopathology.**—The cerebellar hæmangioblastomas not only vary in their tendency to form neoplastic cysts, but also in their histological structure. Cushing and Bailey have found in their group such variations as a predominant capillary neoplasia, a predominant cellular neoplasia and a predominantly cavernous growth. The tumour that we have described suggests its grouping under the second type. The shape of the cells generally, and their faint resemblance to endothelioid cells (except that the present tumour cells are more deeply and homogeneously stained), suggests some connection with the normal endothelial cells lining the capillaries. And yet it appears incorrect to designate the tumour an endothelioma in view of the normal function and fate of the endothelial cell, specially of the central nervous system. True endotheliomata, on the other hand, arise more commonly from the meninges, and give rise to the sand-tumours or psammoma in that membrane. In the site of its formation and the tendency to liquefaction and cyst-formation it also differs from the endotheliomata and these features are more suggestive of a true brain substance tumour. The histological considerations together with the findings point to the more correct description 'a medullo-blastoma associated with a hæmangioma'. That it is a very rare tumour is evidenced by the fact that only two were diagnosed in a total of 67 cases in Cushing and Bailey's series of blood vessel tumours of the brain.

## REFERENCE

Cushing, H., and Bailey, P. (1928). *Tumours arising from the Blood Vessels of the Brain*. Charles C. Thomas, Springfield, Illinois.

following table indicates the distribution of the types of malaria with reference to relapses:—

	Benign tertian	Sub-tertian	Benign and sub-tertian mixed infection
1st relapse cases	5	2	2
2nd relapse cases	2	..	3
3rd relapse cases	..	..	* 2

\* These two patients may be termed 'confirmed relapsers'.

**Scheme of treatment.**—After a routine clinical and microscopical examination, patients are given three ounces of mist. alba and started the same day on atebirin 0.1 gm. three times a day an hour after food and continued for five days. On the morning of the sixth day, the same dose of mist. alba was repeated and plasmochin simplex 0.01 gm. given half an hour after the three principal meals of the day, for five days. Plasmochin was reduced to two doses per day from March 1936. Both the drugs were given orally.

No interval was allowed between the two treatments but no harmful effects were observed, and the relapse rate was not any higher than in the other schemes adopted at other clinics and hospitals.

The earliest relapses were in two patients (with sub-tertian) within four weeks from the day of completion of treatment. Two other cases came in five weeks (mixed infections) and a single benign tertian after six weeks. Of the remaining patients, relapses were noted in three cases in two months, three in three months, one in five, and three more in six months. I can say that the 16 patients tabled in paragraph 3 represented the precise number of relapses of the 187 patients treated, as every one who had a relapse was sent back to hospital. I would not suggest that they were true remissions, as most of my patients went back to duty to highly malarial endemic areas, and the possibilities are that they acquired a fresh infection.

How soon the temperature was brought down to normal after the first dose of atebirin is of more than passing interest, especially to the patient.

Nature of infection	Less than 24 hrs.	24-36 hrs.	36-40 hrs.	48-72 hrs.	Over 72 hrs.
Benign tertian	33	81	49	1	2
Sub-tertian	..	2	7	5	3
Benign tertian and sub-tertian (mixed).	..	..	2	..	2



*By-effects observed*

(a) Cyanosis and dyspnoea were observed in only one case on the second day of atebirin treatment. He was a very highly anæmic patient. Atebrin was suspended for two days and then continued. The patient made an uneventful recovery.

(b) Definite temporary yellow pigmentation of skin was noted in three cases. It called for no special treatment.

(c) A few patients complained of epigastric pain and colic and they were, as a routine, given a mixture containing potassium citrate along with the atebirin and were relieved.

(d) Five patients had a fairly severe diarrhoea but they soon got well with astringents. Atebrin was not suspended.

(e) Two of the cases exhibited giant urticaria when under atebirin, a rather rare sign of toxicity or intolerance. The rash disappeared in 24 hours without any treatment. There was no previous history of similar rashes at any time.

(f) Headaches or giddiness were not complained of, nor were any psychoses noticed.

(g) No unpleasant symptoms were heard of during the administration of plasmochin.

(h) No case ended fatally.

One of the patients came in with hæmoglobinuria but as his blood showed sub-tertian parasites, he was given atebirin at once and was carefully watched. This is the only case in which the temperature persisted for six days but he made a good recovery and has had no relapse since.

Several of my patients had large, or rather very large, spleens and it is my experience that a course of treatment on the above lines reduces considerably the size and varies favourably the consistency of the spleens.

The sense of well-being which is induced when the temperature goes down quickly and keeps below normal, in a patient who tried other remedies in his home and elsewhere with no effect, made him rapidly pick up weight.

Lately it was noticed that four patients developed fever varying from 101° to 103°F. on the last day of plasmochin treatment. While in three of them it came down to normal in 12 to 15 hours, it persisted for three days in the fourth patient. In none was any parasite found in the blood. This would require some explanation by other observers, as I cannot offer any.

Quartan malaria is relatively uncommon in this part of South India and no case was seen.

I am greatly obliged to Dr. C. E. R. Norman, Chief Medical Officer, South Indian Railway, for his kindness in permitting me to publish this report.

## STUDY OF 110 CASES OF DENGUE FEVER IN THE MADRAS PENITENTIARY.

By P. V. KARAMCHANDANI, M.B., B.S.,  
F.R.C.P. (Edin.)

MAJOR, I.M.S.

*Superintendent, Central Jail, Cannanore*

WHILE undergoing training in the Madras Penitentiary, preliminary to embarking on a career in the Madras jail department, I had an opportunity to study an epidemic of dengue fever which was raging in that jail. In all, 110 cases were studied. The epidemic lasted from 10th October to 7th November, 1936.

The present conception of dengue fever is that it is a specific fever occurring in an epidemic form, caused by a filterable virus and conveyed by *Aedes ægypti*.

Different observers have given different descriptions of this fever, but severe rheumatic-like pains, rapid occurrence of other cases, the active form of disease lasting about a week, and hardly any mortality are its constant features.

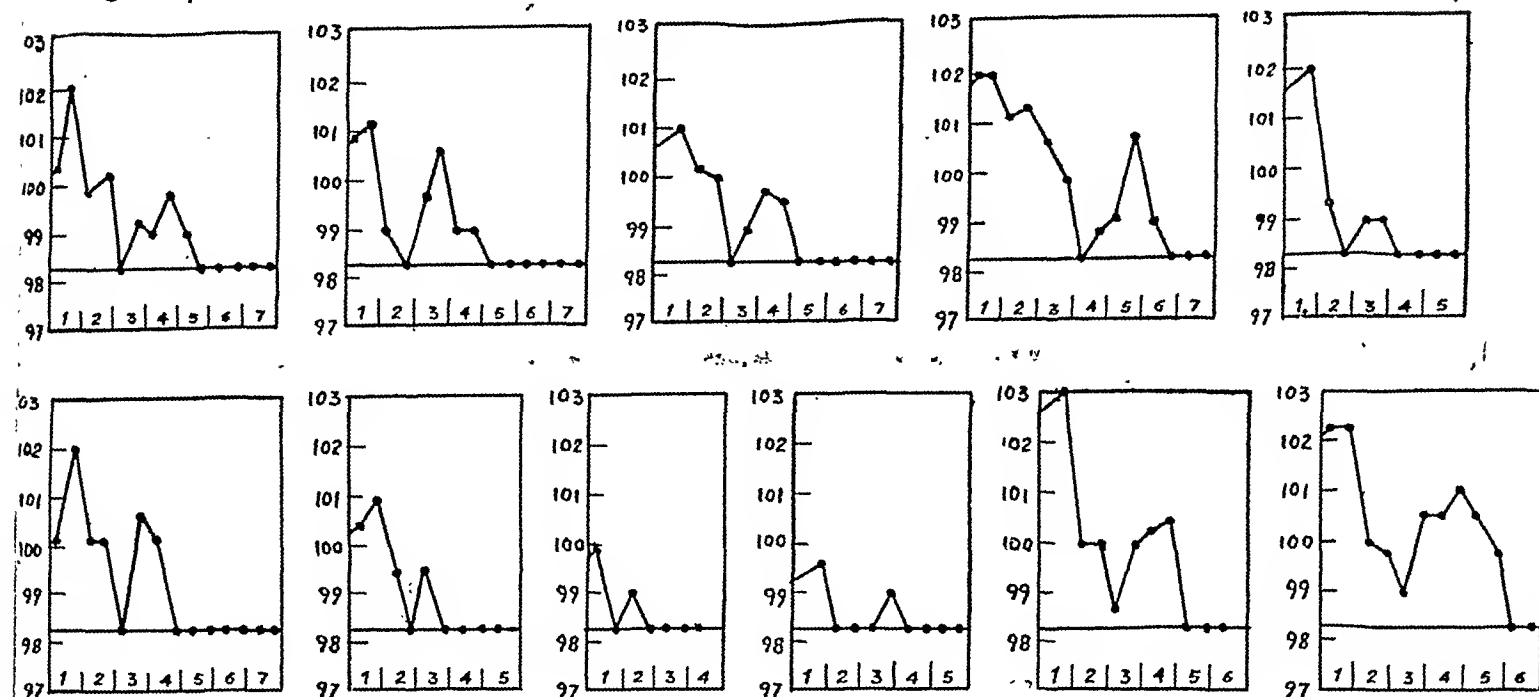
Typical saddle-back temperature curve is not invariably a constant feature of the fever, because continuous temperature lasting 7 days has also been recognized now to be present in dengue fever. For this reason the 5 days' fever of Schöer and the 7 days' fever of Rogers are not considered distinct diseases. In cases under study the onset of fever was sudden, intense headache and backache being constant features of the fever. The congestion of the buccal mucous membrane and soreness of the tongue were also present. Post-febrile weakness was a universal factor. Slow pulse, leucopenia with marked diminution in the number of polymorphonuclear cells (50 to 59 per cent), and relative increase in the number of lymphocytes (40 to 45 per cent) were found to be present. Blood slides showed no malarial parasites. Terminal eruption was not noted in any of the jail cases, although one case with a fair skin, attended by me outside, manifesting all the above-mentioned symptoms, showed a terminal eruption possessing the definite characters of a dengue rash, viz, circular reddish-brown rubeoloid spots one-eighth to half an inch in diameter, thickly scattered, each spot being isolated and surrounded by sound skin. Jaundice and albuminuria were absent.

### *Analysis of temperature curves*

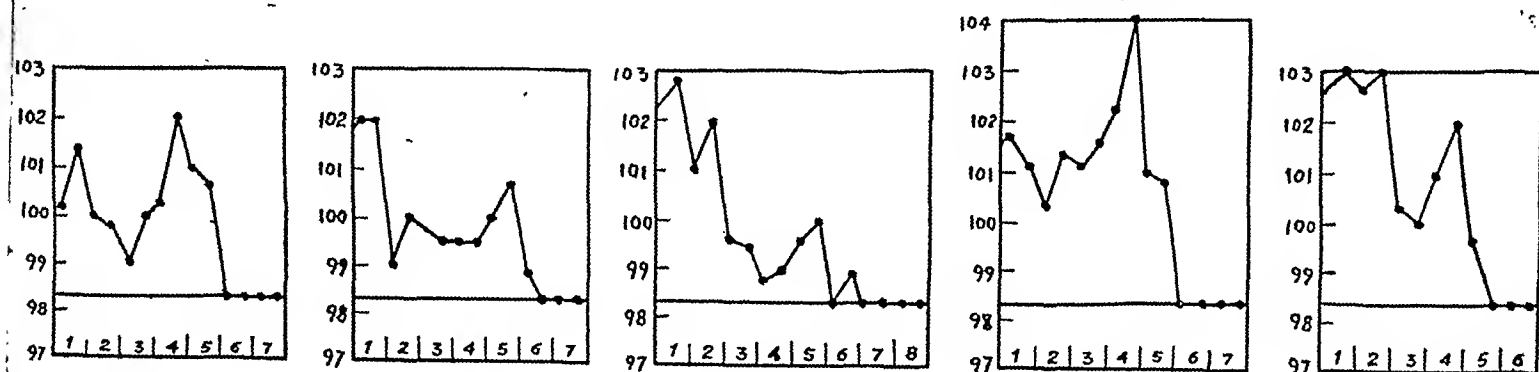
*Group 'A'.*—Fifty-four cases showed saddle-back temperature curve. In 31 of these the temperature touched normal before the secondary rise took place; while in 23 it came down to only 99°F. The average duration of fever was 5.5 days in the former and 5.35 days in the latter.

*Group 'B'.*—Seventeen cases showed a continuous temperature lasting on the average 7.17 days.

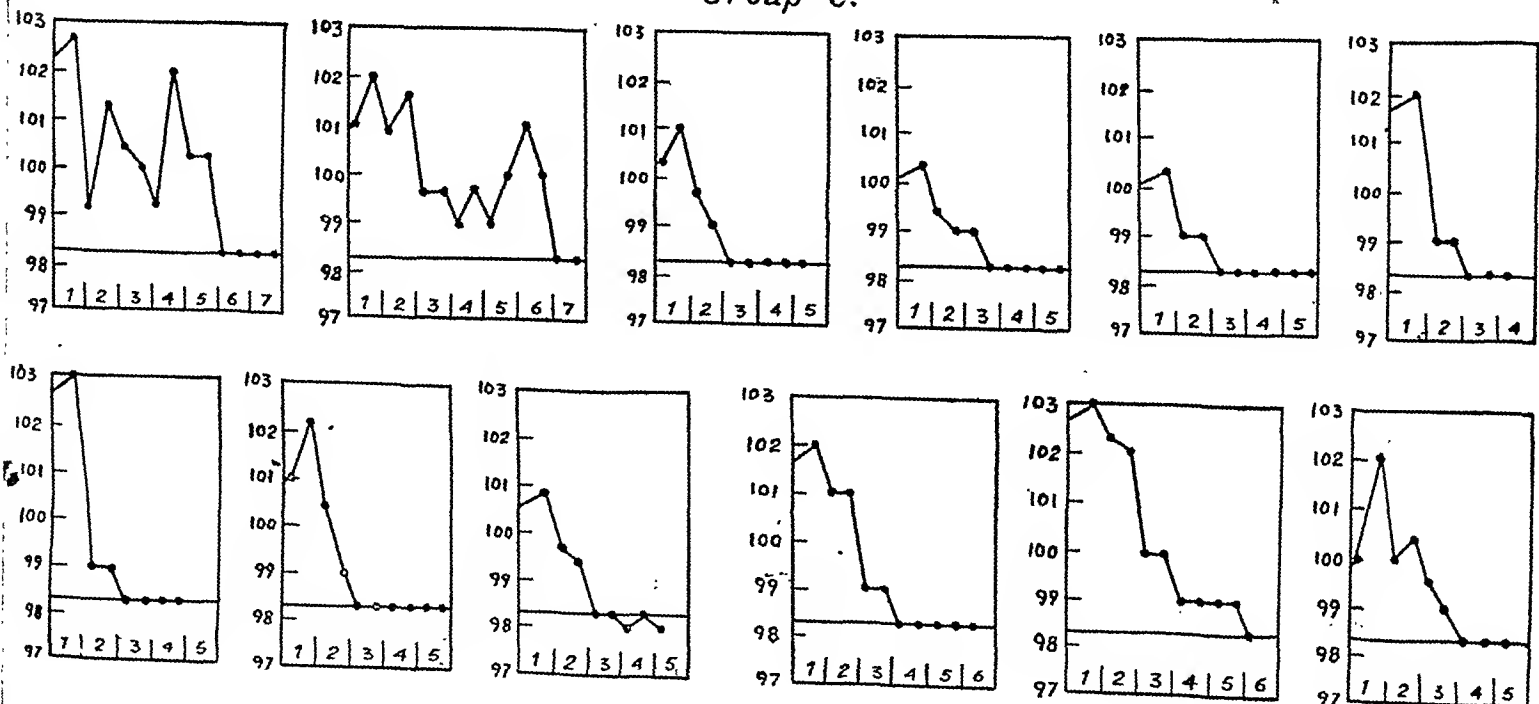
Group A.



Group B.



Group C.



Group 'C'.—Thirty-nine cases showed features of temperature like those of class 'A' with this exception that no secondary rise occurred. The average period of fever was 3.28 days.

Specimens of temperature charts, 14 of 'A' group, 4 of 'B' and 10 of 'C' group, are herewith appended.

### Vector problem

Graham in Beirut, Syria, in 1906 was the first to suggest the rôle of *Culex fatigans* in the transmission of dengue fever virus (Manson-Bahr, 1929). Later Cleland, Bradley and Macdonald in Australia asserted that it was *Aedes ægypti* and not *Culex fatigans* which conveyed the virus of dengue fever. In 1931 Simmons in the Philippines showed that *Aedes albopictus* is an efficient carrier of dengue virus in that island.

With a view to substantiating the above findings in the present epidemic, swatting parties were organized to make a thorough search of mosquitoes at dawn and catches of each day were scrutinized. Just three only out of three thousand odd catches consisted of members of the *Aedes* genus, the rest being *Culex fatigans*. The majority of mosquitoes were engorged females. It may be argued that mere absence of *Aedes* in catches is no proof that *Aedes* was not connected with the occurrence of this epidemic. But those who have studied ecology of the Culicini sub-family of Diptera know too well that, after feeding, most of these mosquitoes rest on walls or other resting places relatively close to where they obtained their blood meal, that until they digest the meal they are not ready for flight, and that those which have digested the meal depart from their resting places soon after daylight. That is the reason why a large number of the catches consisted of engorged females.

While working in London with Professor P. A. Buxton of the London University, I did research work on 'Ecology of culicini' and published a paper (Karamchandani, 1935). Intimate knowledge of the habits of *Culex fatigans* which I then obtained helped me in the present investigations.

My conclusion is that *Culex fatigans* was mainly responsible for the epidemic under review. Further, I may point out that the worst breeding places of *Culex fatigans* in Madras have so far been untouched by the health authorities. So far as Madras town is concerned this is a dangerous mosquito. Contrary to what one finds in Northern India, I found this mosquito breeding in wells in the compounds of bungalows and houses. The general belief that *Culex fatigans* breeds in dirty

(Continued at foot of next column)

## ELECTRODIALYSIS IN THE PURIFICATION OF CONCENTRATED SERUM ANTITOXIN

By NIRMALA PADA CHATTERJEE, M.Sc.  
Chief Chemist, Indian Health Institute and Laboratory,  
Limited, Calcutta

SERUM antitoxin is usually concentrated by the separation of immune pseudoglobulin by fractional precipitation with ammonium sulphate solution and dialysing the precipitate in parchment or cellophane paper bags to remove the salt. The dialysed serum is then purified by isoelectric precipitation of inactive proteins and phospholipoidal matters. To obtain a satisfactory isoelectric precipitation, the dialysis should be thorough enough to produce a specific resistance of 3,000 ohms in the serum. But very often as much as ten days of continuous dialysis are not sufficient to remove the electrolyte to that extent. The dialysis is usually carried on against running tap water and, in Calcutta the average specific resistance of tap water being 2,500 to 3,000 ohms, it is quite possible that a greater period would be required for the necessary salt purification. In a tropical country like India, exposure for such a long time may lead to gross contamination and decomposition of the serum.

Figure 1 shows the rate of dialysis of pseudoglobulin precipitate in a cellophane paper bag against running tap water. Up to the fifteenth hour the resistance does not increase appreciably, then there is a rapid rise up to the

(Continued from previous column)

water and relegates water of wells to anopheles is not correct in Madras town at least.

I have to thank Lieut.-Colonel S. C. Contractor, I.M.S., for allowing me facilities to carry on these investigations in his jail. I have also to thank T. G. Rutherford, Esq., C.I.E., I.C.S., Inspector-General of Prisons, Madras, for kind permission to publish this paper.

[Note.—We are publishing this paper because we think that the clinical analysis, limited though it is, of 110 cases occurring in one epidemic is a matter of some general interest. The temperature charts also are instructive, but it is a pity that the examples of charts of the author's group 'B' differed so little in their general character from those of group 'A' and that in none was the duration more than six and a half days.

We do not, however, think that the author's present contributions to the ecology of culicines and to the transmission problem of dengue will in any way upset established opinion on these subjects. Granting him his extensive experiences of the ecology of culicines, we are not convinced by his arguments regarding the part played by *Culex fatigans* in this epidemic of dengue.—  
Editor, I. M. G.]

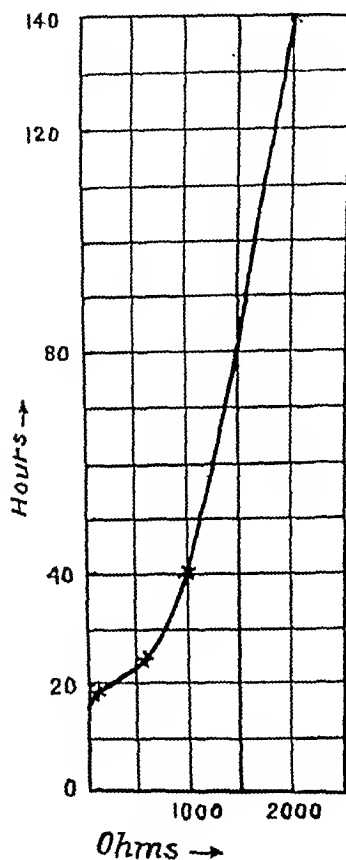
### REFERENCES

- Karamchandani, P. V. (1935). *Rec. Malaria Survey, India*, Vol. V, p. 23.  
Manson-Bahr, P. H. (1929). *Manson's Tropical Diseases*. Cassell and Co., Ltd., London.

fortieth hour when the resistance is about 1,000 ohms, thereafter the rise is extremely slow.

In Europe and America electro dialysis is often employed to shorten the period of dialysis. By this means 24 to 48 hours are sufficient to remove practically the last trace of electrolyte. The chief difficulty in electro dialysis is that, if it is not carried out under suitable conditions, there is the chance of generation of heat and acidity, both of which are detrimental to the

Fig. 1.



maintenance of potency of the serum antitoxin. The temperature should not be allowed to exceed 36°C. and the pH should not drop below 5.6.

The present work was undertaken to find out the condition under which such changes of temperature and hydrogen ion concentration take

place and then to determine a general workable basis for conducting quick and efficient electro dialysis without appreciable deterioration of potency.

A Pauli- glass cell was fitted with : electrodes of 1 sq. cm. electrode surface. Parchment and cellophane papers were used as the cathode and anode membranes respectively. The distance between the membranes was 5 cm. and the capacity of the middle chamber was about 30 c.cm. The electrodes were connected to the 220-volt main through a multiple range milliampere-voltmeter and an adjustable resistance.

The pH of the serum was measured with quinhydrone-hydroquinone electrode and the electrical resistance was measured with a sensitive conductivity apparatus at 30° ± 1°C.

The middle chamber of the electro dialysing cell was fitted with 20 c.cm. of normal horse serum. Distilled water was allowed to flow through the side chambers at a uniform rate, regulated by means of pinch-cocks attached to the exit pipes. The serum was constantly stirred with a platinum spiral during the course of electro dialysis. An external resistance of 1,400 ohms was put in the circuit in series.

The above table shows the variation of specific resistance and pH of the serum with the progress of dialysis. It also shows the simultaneous changes of current, voltage and wattage with and without the external resistance. It is found that so long as the current employed is above 10 milliamperes or the electrical energy employed is more than 2 watts per sq. cm. of electrode surface (the electrode surface of the cell used is 1 sq. cm.), heat is generated specially at the cathode, and occasionally the current has to be stopped to prevent excessive heating.

Figure 2 indicates variation of the electrical energy flowing through the cell with the variation of the specific resistance of the serum during electro dialysis. It shows that when the electrical energy drops to 2 watts, the specific resistance of the serum is about 400 ohms. Normal horse serum was, therefore, dialysed in a cellophane paper bag against running water

TABLE I

Hours of dialysis	Specific resistance of serum	pH	WITH EXTERNAL RESISTANCE			WITHOUT EXTERNAL RESISTANCE		
			Milliampere	Volt	Watt	Milliampere	Volt	Watt
0	67	7.6	40	164	6.6	53	220	11.6
6	300	4.7	16	201	3.0	17	220	3.7
11	1200	4.7	5	213	1.1	5.2	220	1.1
20	7150	5.0	0.9	219	0.2	0.9	220	0.2

for 15 hours. The specific resistance after dialysis was 430 ohms. The serum was then subjected to electro dialysis. No external resistance was applied.

TABLE II

Hours of dialysis	Specific resistance of serum	pH	Milliampere	Watt
0	430	7.4	11	2.3
3	1240	6.0	6	1.3
7	3000	6.0	3	0.66

There was no heating effect. The necessary purification was attained in seven hours. It is also seen that the pH does not decrease much. Perhaps the absence of excessive acid formation is responsible for the shorter time necessary.

Dialysis of concentrated serum was next tried in a similar way. Diphtheria antitoxic serum

serum with a protein content of about 18 per cent were placed for electro dialysis.

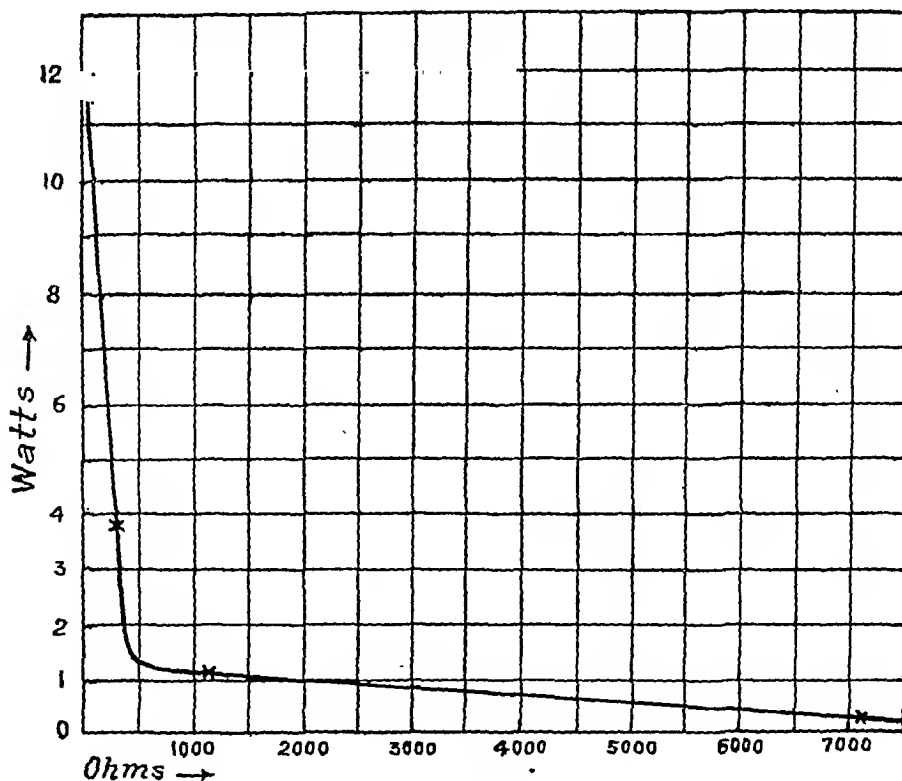
TABLE III

Hours of dialysis	Specific resistance of serum	pH	Milliampere	Watt
0	450	7.4	10	2.0
3	1100	5.0	7	1.5
9	3000	5.0	5	1.1

In this case, even when the energy strength was only 1.5 watt, there was heating at the cathode. The pH was as low as 5. It seems that when ammonium sulphate is to be dialysed out, a lower electric energy should be employed to prevent heating.

Another 20 c.cm. of the plain-dialysed serum was electro dialysed at an initial electrical energy of 1.1 watt with the help of an external resistance.

Fig. 2.



was concentrated by the usual process of fractional precipitation of immune pseudoglobulin with ammonium sulphate. The precipitate of pseudoglobulin contained huge amounts of ammonium sulphate which was to be removed by dialysis. The pressed precipitate was taken in a cellophane paper bag and was dialysed against running water. After 18 hours of dialysis the specific resistance of the serum was 110 ohms and the pH was 5.8. The pH was adjusted to 7.4 with sodium carbonate solution. After 24 hours' dialysis the resistance was 450 ohms and the pH was 7.4. Twenty c.cm. of this

TABLE IV

Hours of dialysis	Specific resistance of serum	pH	Milliampere	Watt
0	450	7.4	7	1.1
5	900	6.0	7	1.0
10	2000	5.9	5	1.1
15	3200	5.9	4	0.88

external resistance removed.

The acid formation is much less and there was no heating effect. The serum was taken out and filtered. The antitoxic potency of the serum before and after electrodialysis was determined by flocculation tests.

TABLE V

Serum	Potency in international units
Plain-dialysed .. ..	1,200 units per c.cm.
Electrodialysed (table III)	540 " " "
Electrodialysed (table IV)	1,150 " " "

The heating and acid formation are seen to cause more than 50 per cent reduction of potency whereas when such effects are arrested the loss of potency is less than 5 per cent.

In normal horse serum the main electrolytic constituent is the sodium chloride while in the plain-dialysed concentrated serum it is the ammonium sulphate. During electrodialysis of ammonium sulphate, ammonia is formed at the cathode end and sulphuric acid at the anode end. The degree of dissociation of ammonia is much less than that of sulphuric acid. The electrical resistance at the cathode end is, therefore, much greater than at the anode and consequently the electrical energy spent at the cathode end is comparatively higher. This possibly leads to the generation of heat at the cathode. The accumulation of acid in the middle chamber is caused by the relatively weaker permeability of the sulphate ions through the anode membrane than that of the ammonium ions through the cathode membrane. The heating is avoided by applying a low electrical energy, *e.g.*, 1 watt per sq. cm. of electrode surface, and it seems that when such a low electrical energy is applied, the difference in permeability of ammonium and sulphate ions through the membranes is less; this prevents too much lowering of pH in the middle chamber.

To test whether acid formation and heating, even when an electrical energy of 2 watts is employed, are due to ammonium ions, pure solutions of ammonium sulphate and sodium sulphate were separately electrodialysed under similar conditions. With a 10 per cent solution, using an electrical energy of 2 to 3 watts (40 to 50 milliamperes), in the case of sodium sulphate, the anode or the cathode did not get heated and although the reaction of the middle chamber became slightly acidic ( $\text{pH}=6$ ), it could be maintained neutral if, instead of distilled water, a 0.01N sodium hydroxide solution was

allowed to flow through the side chambers. But in the case of ammonium sulphate, the cathode was soon very hot and the pH went down to 4. Substitution of 0.01N sodium hydroxide solution for distilled water could produce no appreciable change.

### Conclusion

It is generally claimed that when positively charged membranes such as cellophane paper, hæmoglobin-collodion, etc., are substituted for a negatively charged membrane such as the parchment paper, at the anode, the permeability of anions is increased and the accumulation of acid in the middle chamber is prevented. Adolf and Pauli (1924) use the parchment paper membrane on both sides and according to them it has no effect on the acid production if currents more than 10 milliamperes per sq. cm. of electrode surface are not used. In the above experiments, although cellophane paper was used at the anode, the accumulation of acid seemed to depend more on the electric energy employed and on the nature of the electrolyte present in the serum. With salts of weak bases the electrical energy employed should be small, the weaker the base the smaller the energy to be employed.

The generation of heat and acidity is more or less concomitant. If heating is prevented acid formation is also arrested. The strength of electrical energy employed, determines the heat produced. To prevent heating, it is therefore essential to determine at first the maximum electrical energy that can be applied in a particular solution without disturbing the thermal equilibrium.

### Summary

The immune pseudoglobulin precipitate containing ammonium sulphate is dialysed in a cellophane paper bag till the specific resistance of the dialysed serum is about 400 ohms. It is then electrodialysed with an electrical energy of 1 watt per sq. cm. of electrode surface. When the specific resistance increases to about 3,000 ohms the dialysis is stopped and the serum is ready for isoelectric precipitation of inactive materials. The dialysis is complete in 40 hours and the serum suffers from no abnormal change of pH and temperature nor appreciable deterioration of potency.

If salts of stronger bases such as sodium sulphate are used for globulin precipitation, higher electrical energy can be used and the period of electrodialysis can be shortened considerably.

### REFERENCE

Adolf, M., and Pauli, W. (1924). *Biochem. Zeitschr.*, Vol. CLII, p. 360.



# PROGNOSTIC SIGNIFICANCE OF ICTERUS INDEX IN LOBAR PNEUMONIA

By S. M. K. MALLICK, M.B., M.R.C.S.,  
M.R.C.P. (Lond.), D.P.H.  
CAPTAIN, I.M.S.

and

BALDEV SINGH, M.B., M.R.C.P. (Lond.)  
(Government Medical School, Amritsar)

"CAPTAIN of the men of death" as Osler  
named it, several decades ago, lobar pneumonia

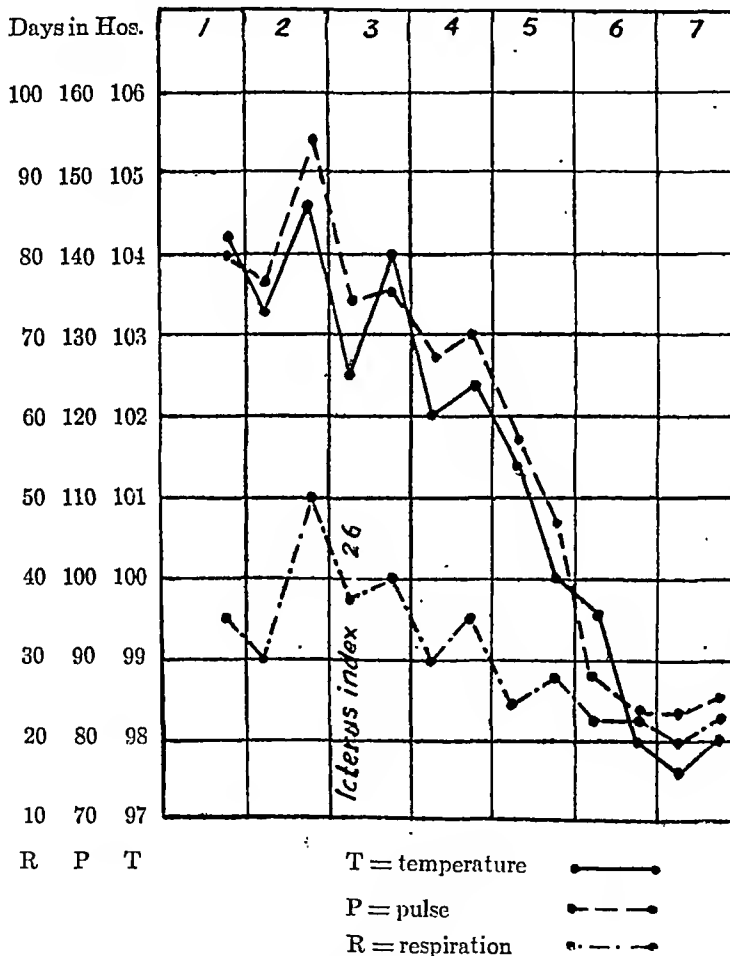
the disturbance, is either anoxæmia, toxæmia  
or very often both.

As to what rôle anoxæmia plays in this  
disease, how to detect it and how best to deal  
with it, have already been dealt with in a  
separate paper by one of the writers of this  
article (B. S.). In this paper it is proposed  
to present a study of cases who suffered from  
lobar pneumonia, in so far as the icterus index  
is concerned. It has been found useful in  
determining toxæmia in these cases.

Howard (1936) has referred to the impair-  
ment of liver function in cases of lobar

## CASE 1

Name....Chatru. H. M. Age....18 years.



Lobar pneumonia, right upper lobe.

Sputum examination, pneumococci + +.

Total white cell count = 13,000 per c.mm. blood.

Differential count:—

Polymorphonuclears	..	..	75 per cent.
Lymphocytes	..	..	25 "
Large mononuclears	..	..	0 "
Eosinophiles	..	..	0 "

Marked toxæmia lasted up to the fourth day.

No cyanosis noticed.

still remains the most fatal disease for those  
who fall a prey to it. Whether it is the circula-  
tory, the respiratory or both mechanisms  
together which fail ultimately and bring about  
death, the essential defect, which really causes

pneumonia and in this connection mentions  
Bernheim's observations regarding the increase  
of icterus index in this disease. There is however  
no reference to the conclusions drawn from his  
work.

We have studied it in 13 cases of lobar pneumonia, the records of nine of whom are submitted herewith in graphic form. Four cases have been omitted because they are very like the recorded cases.

*Reagents and apparatus.*—(1) There are only two solutions used: (a) 1 : 10,000 watery solution of potassium dichromate prepared according to the technique given in 'Nicholson's Laboratory Methods'. It keeps well for quite a long time if kept in a dark place, and (b) 0.9 per cent sodium chloride solution.

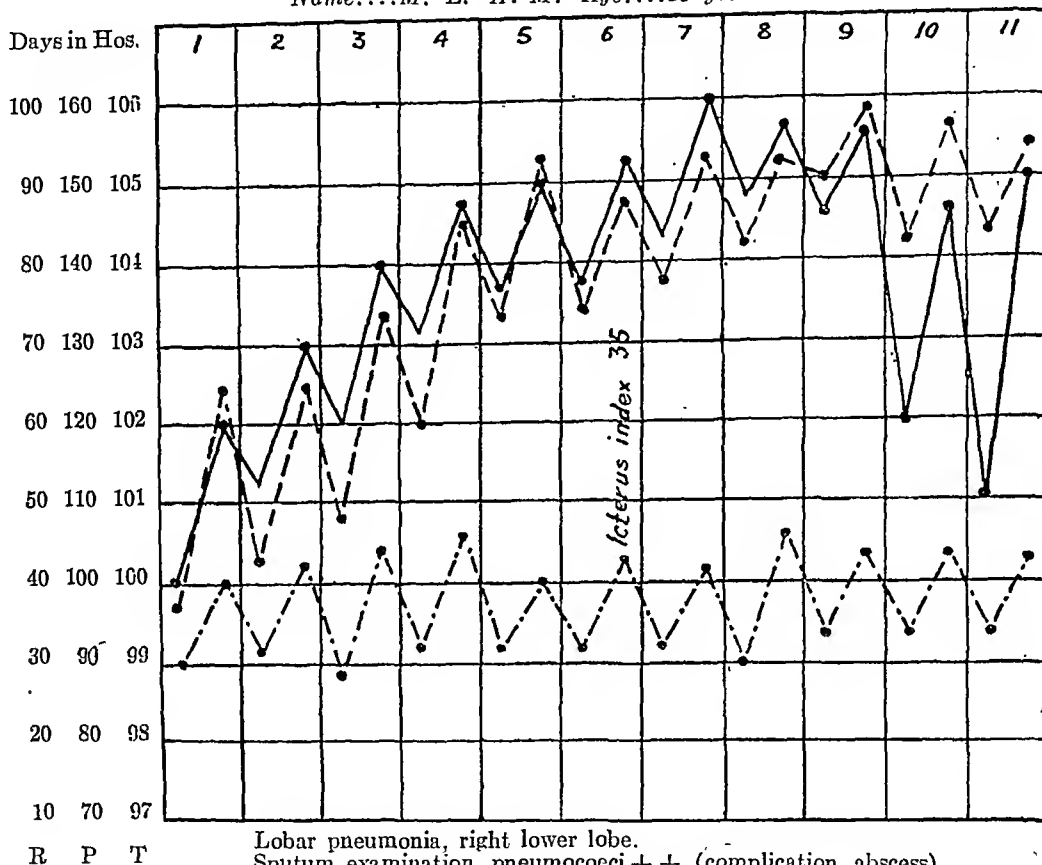
tube with each addition to ensure uniformity of the mixture. The dilution is continued till the colour of the fluid in the two tubes matches. The final reading is then taken. The icterus index is equal to the number of c.cm. of saline added plus 1 c.cm. of serum taken originally.

The 13 cases studied in this way gave three types of results:—

(1) There were six cases, four of whom are shown in the graphs, with icterus indices 26, 35, 17, 21, 19 and 36 respectively, the normal being

## CASE 2

Name....M. L. H. M. Age....18 years.



Lobar pneumonia, right lower lobe.

Sputum examination, pneumococci ++ (complication abscess).

Total white cell count = 24,000 per c.mm. blood.

Differential count:—

Polymorphonuclears	..	..	82 per cent.
Lymphocytes	..	..	18 "
Large mononuclears	..	..	0 "
Eosinophiles	..	..	0 "

Conjunctivæ tinged with jaundice from third day of observation.

Toxæmia marked during the whole illness.

No cyanosis found.

(2) The apparatus consists of (a) the comparator, a wooden stand accommodating two tubes, 6 inches by 3/4 inch size, with a blind glass at the back, and (b) one 100 c.cm. cylinder.

*Technique.*—Four c.cm. of the patient's blood are removed first thing in the morning, before he has his breakfast. Every possible care is taken to avoid hæmolysis. Serum is pipetted off from the clotted blood after about two hours and is centrifuged, to make it as clear as possible.

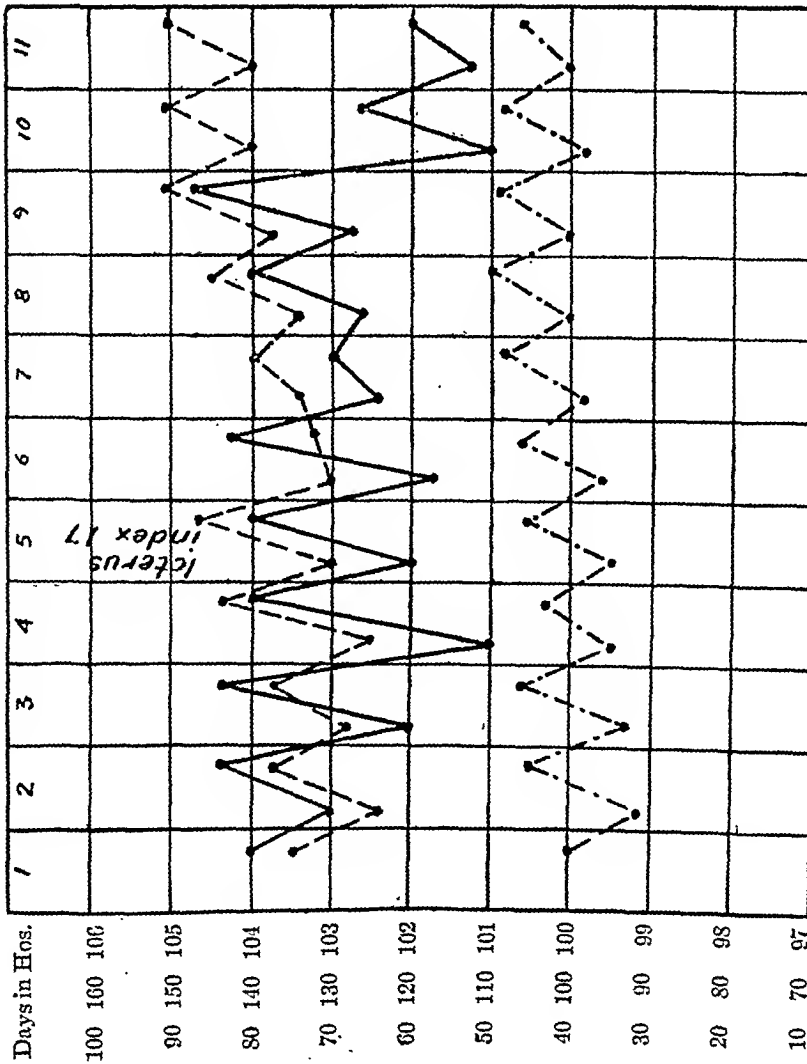
In one tube of the comparator 10 c.cm. of potassium dichromate solution are put and in the other 1 c.cm. of serum is poured. To the serum 0.9 per cent saline is gradually added from the 100 c.cm. cylinder noting down the initial reading of the cylinder, shaking the

from 3 to 6. Every one of these cases had marked toxæmia but no cyanosis, with the exception of the last who had both, and came to hospital in a collapsed condition, with bases of both lungs consolidated. He died within eight hours of admission. Out of the two cases who survived, the one with icterus index 35 developed lung abscess.

(2) There were five cases, four of whom have been recorded here whose indices were 5, 8, 8, 8, and 6 respectively, none of whom showed marked toxæmia, although some of them had

CASE 3

Name.....*Hatu*. M. M. Age....30 years.



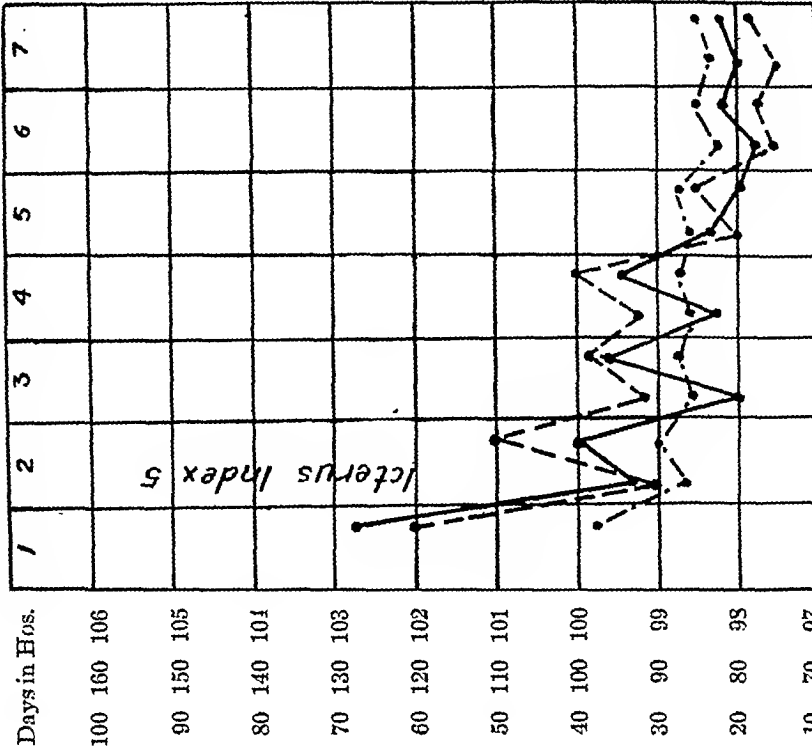
Lobar pneumonia, right lung, all lobes.  
Sputum examination, pneumococci + +.  
Differential count (on third day):—

Polymorphonuclears	..	56 per cent.
Lymphocytes	..	40 "
Large mononuclears	..	4 "
Eosinophiles	..	0 "

Toxaemia increased from fourth day till he died.  
No cyanosis observed.

CASE 5

Name.....*Bhagwan Das*. H. M. Age....25 years.



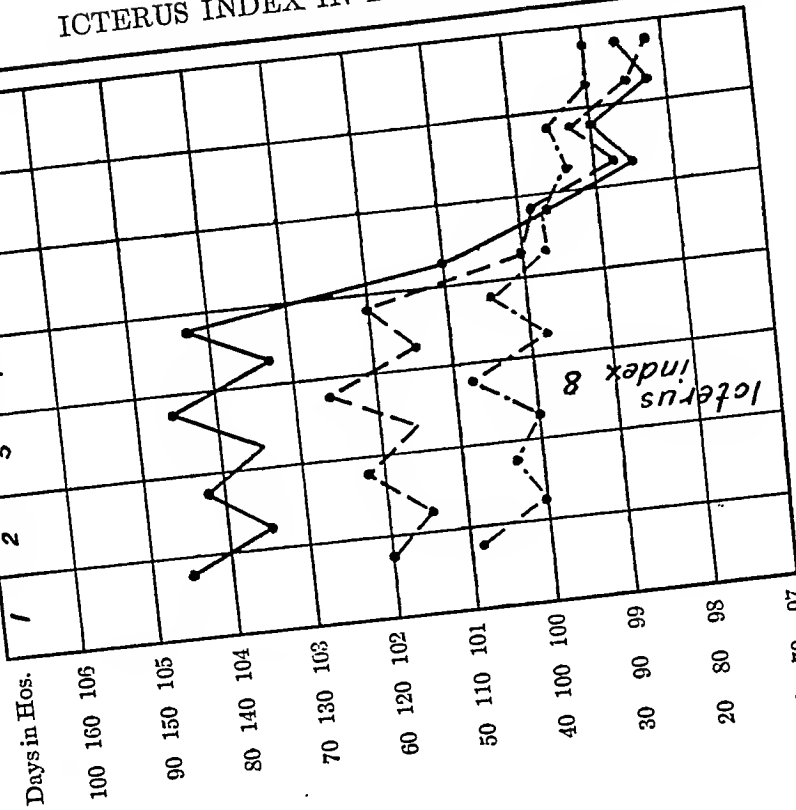
Lobar pneumonia, right upper and middle lobes.  
Sputum examination, pneumococci + +.  
No signs of toxæmia detected. Faint cyanotic tinge found on day of admission which disappeared after oxygen inhalation.

SEPT., 1937]

# ICTERUS INDEX IN LOBAR PNEUMONIA: MALLICK & SINGH 541

CASE 6

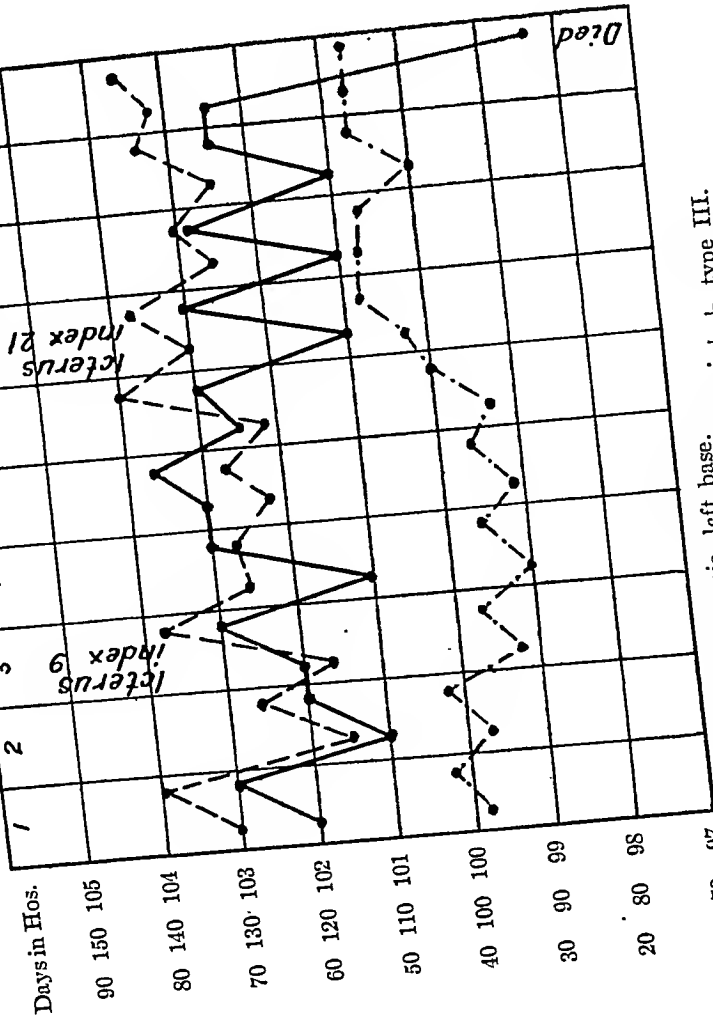
Name.....H. L. H. M. Age.....38 years.



Lobar pneumonia, right upper lobe.  
Sputum examination, pneumococci + +.  
Total white cell count = 15,600 per c.mm. blood.  
Differential count:—  
Polymorphonuclears .. 76 per cent.  
Lymphocytes .. 24  
Large mononuclears .. 0  
Eosinophiles .. 0  
Patient had sthenic reaction.  
No cyanosis, not much toxæmia.

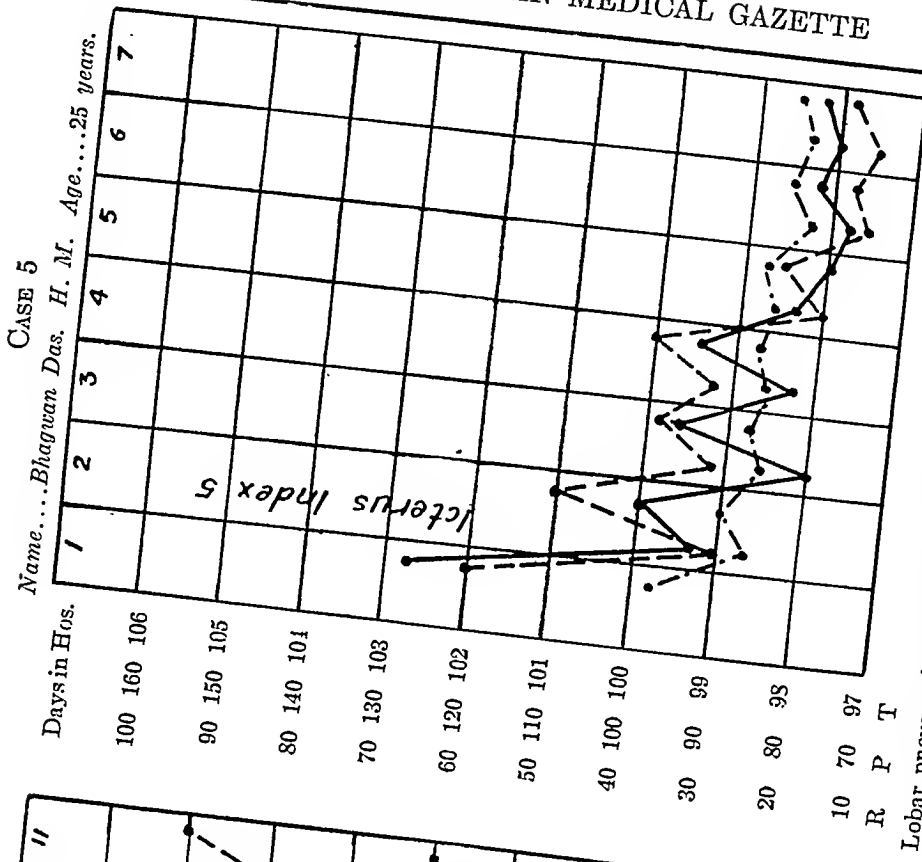
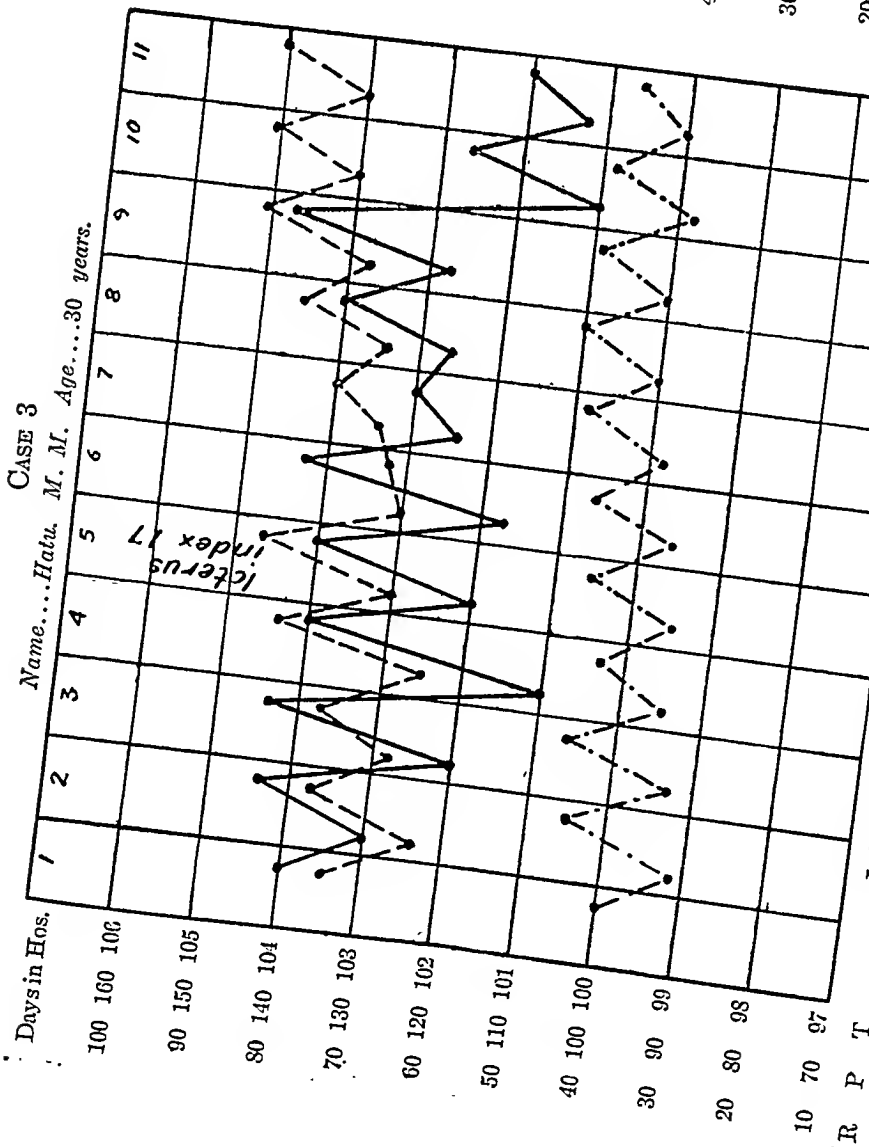
CASE 4

Name.....Kali. O. M. Age.....27 years.



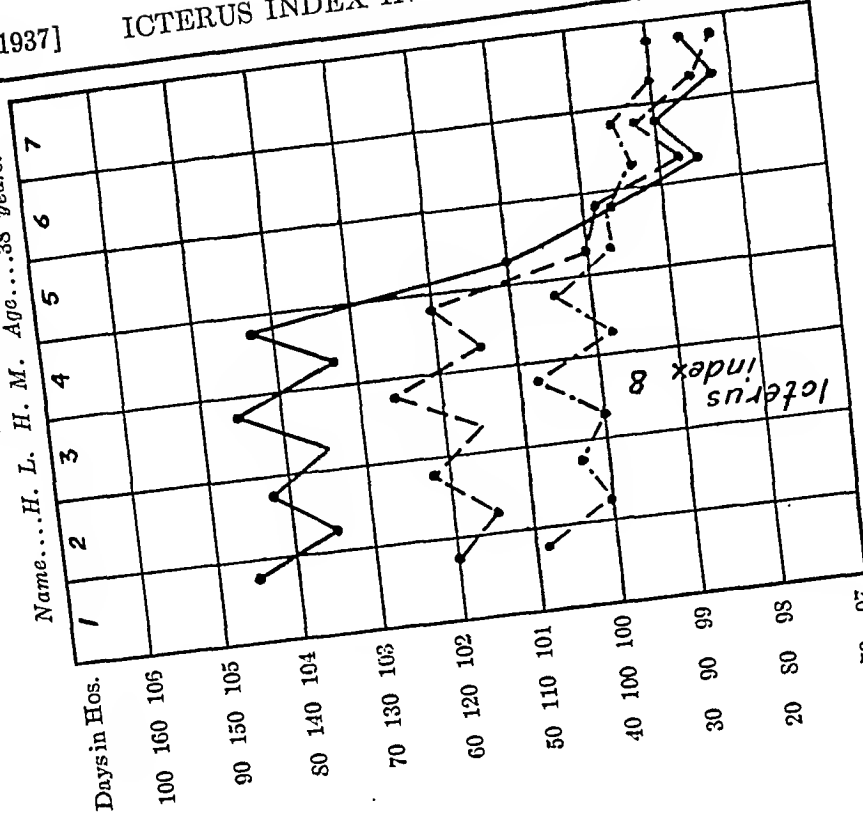
Lobar pneumonia, left base.  
Sputum examination, pneumococci + +, type III.  
Total white cell count = 16,000 per c.mm. blood.  
Differential count:—  
Polymorphonuclears .. 90 per cent.  
Lymphocytes .. 6  
Large mononuclears .. 4  
Eosinophiles .. 0  
Toxæmia developed on fifth day and continued till death.  
No apparent cyanosis.

Died



CASE 6

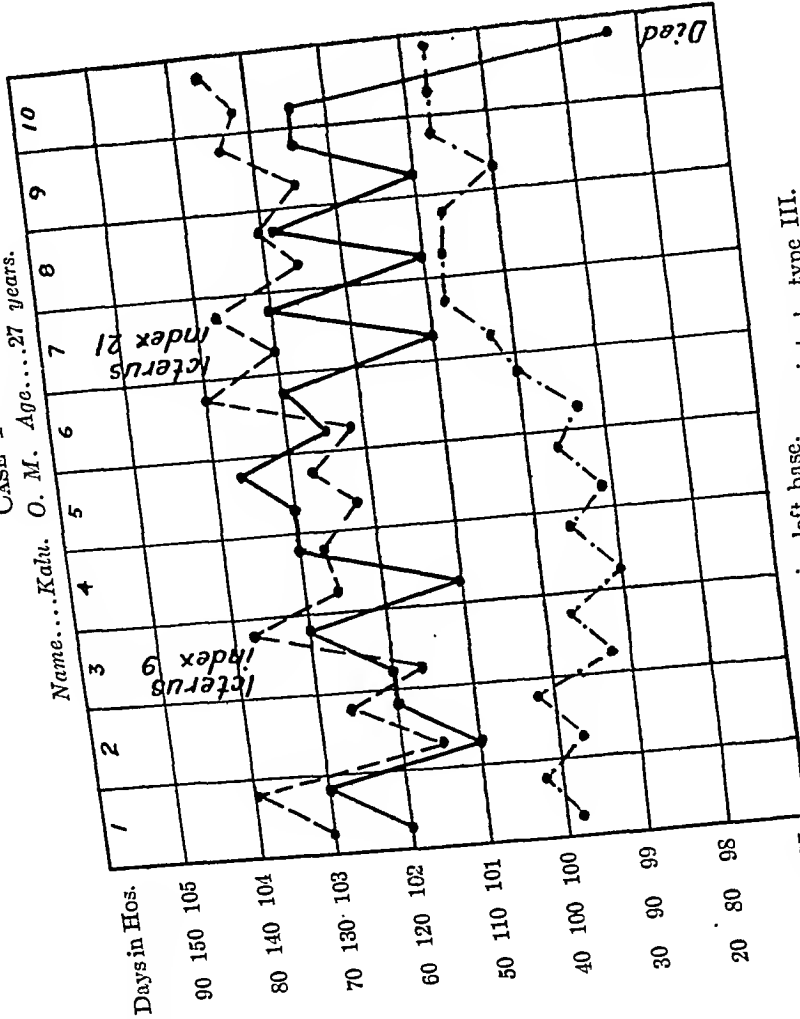
Name.....H. L. H. M. Age.....38 years.



R P T  
 Lobar pneumonia, right upper lobe.  
 Sputum examination, pneumococci + +.  
 Total white cell count = 15,500 per c.mm. blood.  
 Differential count:—  
 Polymorphonuclears .. 76 per cent.  
 Lymphocytes .. 24 "  
 Large mononuclears .. 0 "  
 Eosinophiles .. 0 "  
 Patient had sthenic reaction.  
 No cyanosis, not much toxæmia.

CASE 4

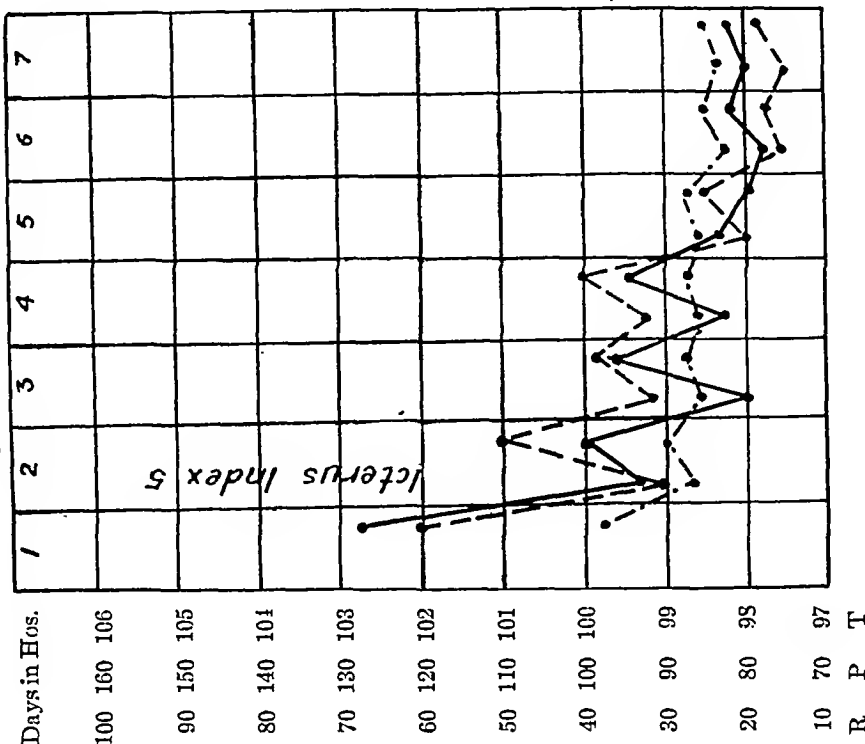
Name.....Kalu. O. M. Age.....27 years.



R P T  
 Lobar pneumonia, left base.  
 Sputum examination, pneumococci + +, type III.  
 Total white cell count = 16,000 per c.mm. blood.  
 Differential count:—  
 Polymorphonuclears .. 90 per cent.  
 Lymphocytes .. 6 "  
 Large mononuclears .. 4 "  
 Eosinophiles .. 0 "  
 Toxæmia developed on fifth day and continued till death.  
 No apparent cyanosis.



## CASE 5

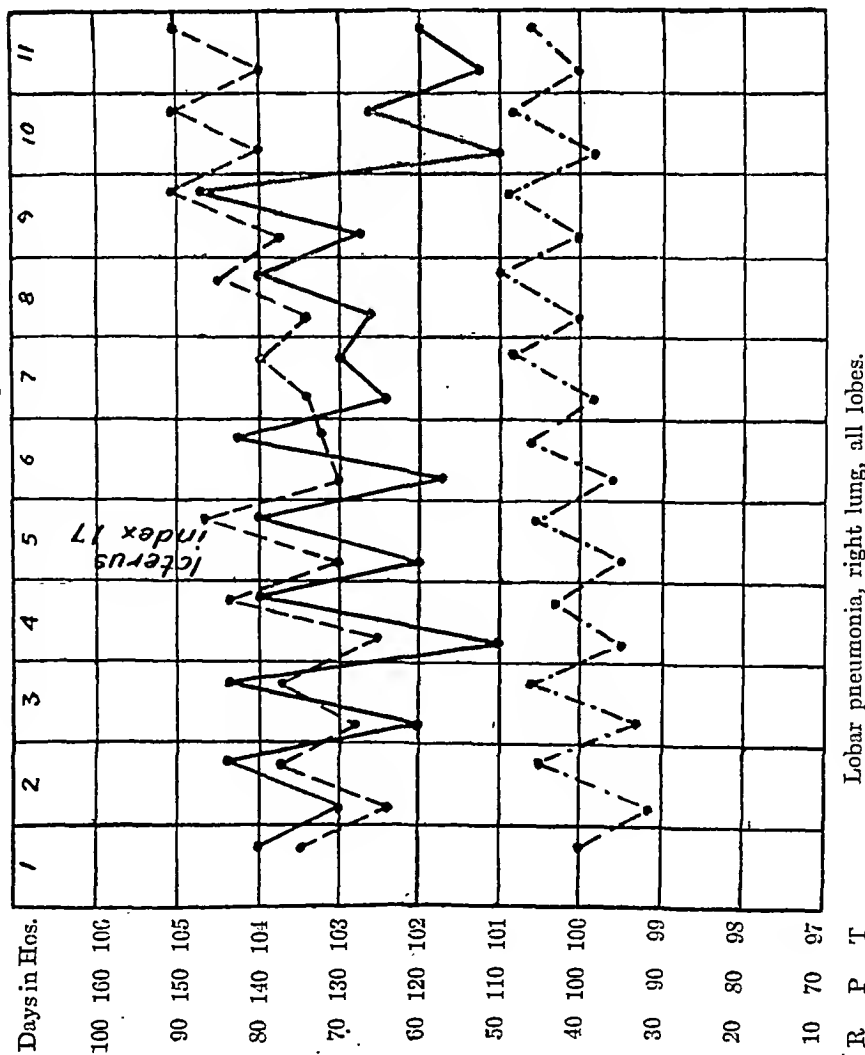
Name....*Bhagwan Das*. H. M. Age....25 years.

Lobar pneumonia, right upper and middle lobes.

Sputum examination, pneumococci + +.

No signs of toxæmia detected. Faint cyanotic tinge found on day of admission which disappeared after oxygen inhalation.

## CASE 3

Name....*Hatu*. M. M. Age....30 years.

Lobar pneumonia, right lung, all lobes.

Sputum examination, pneumococci + +.

Differential count (on third day) :-

Polymorphonuclears .. 56 per cent.

Lymphocytes .. 40

Large mononuclears .. 4

Eosinophiles .. 0

Toxæmia increased from fourth day till he died.

No cyanosis observed.

cyanosis at the stage of illness when blood was taken for the test. None of these patients died.

(3) There were two atypical cases, both above the age of 50 years. The graphic record of one of these is given here. Their bloods gave icterus indices 17 and 21 respectively. They neither had any marked toxæmia nor cyanosis. Both recovered after suffering from a mild type of the disease. In these cases it is perhaps possible that their livers were damaged otherwise and not by the pneumonia. These cases were admitted to the hospital for some gastro-intestinal disturbance and got the attack of lobar

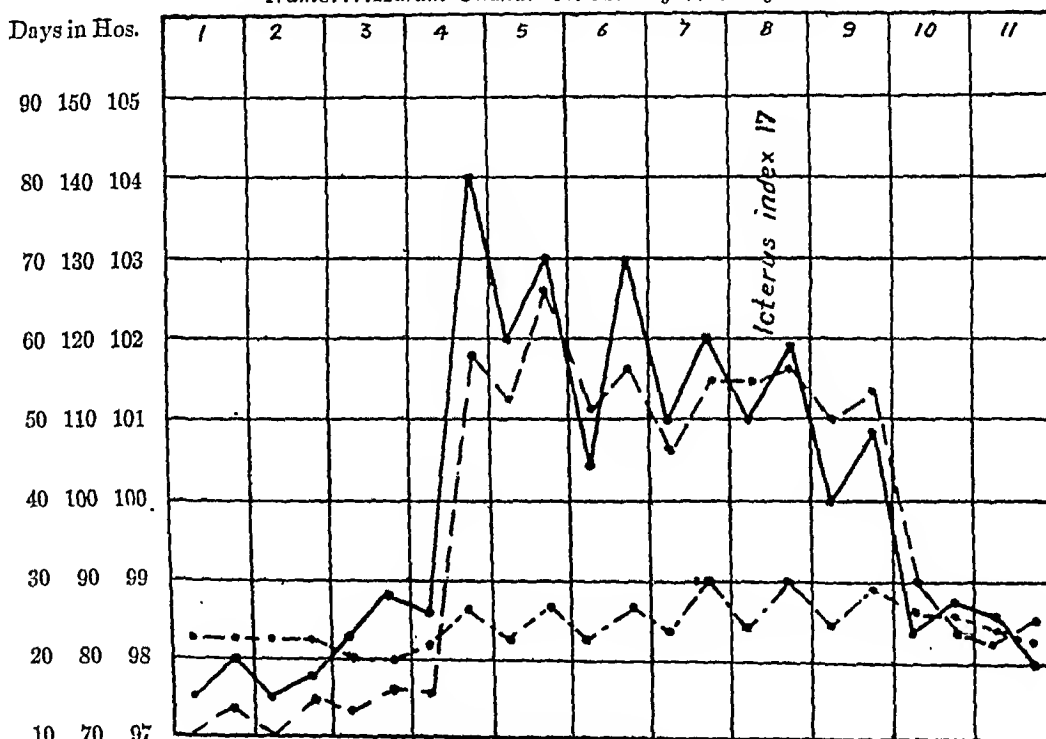
to determine toxæmia in cases of lobar pneumonia.

We, having been much impressed with these observations and this simple index of toxæmia in lobar pneumonia, intend to extend our studies as a routine measure in all the available cases in future, and it is hoped that other clinicians will take advantage of this apparently useful prognostic aid.

Our thanks are due to the Inspector-General, Civil Hospitals, Punjab, for his kind permission to carry out this investigation and to the Medical Superintendent, V. J. Civil Hospital, Amritsar,

### CASE 9

Name....Karam Chand. H. M. Age....50 years.



Atypical lobar pneumonia, right side.

Sputum examination, a few pneumococci found.

Total white cell count = 10,750 per c.mm. blood.

Differential count:—

Polymorphonuclears	62 per cent.
Lymphocytes	37 "
Large mononuclears	1 "
Eosinophiles	0 "

No marked toxæmia, no cyanosis.

pneumonia after they were in the ward for a few days.

It would appear therefore from this study that the six cases who had marked toxæmia during the illness showed a high index, five without much toxæmia, but some of them with cyanosis had nearly normal indices. The two old cases gave conflicting results.

### Conclusion

It can be confidently stated from this study that icterus index is a good guide

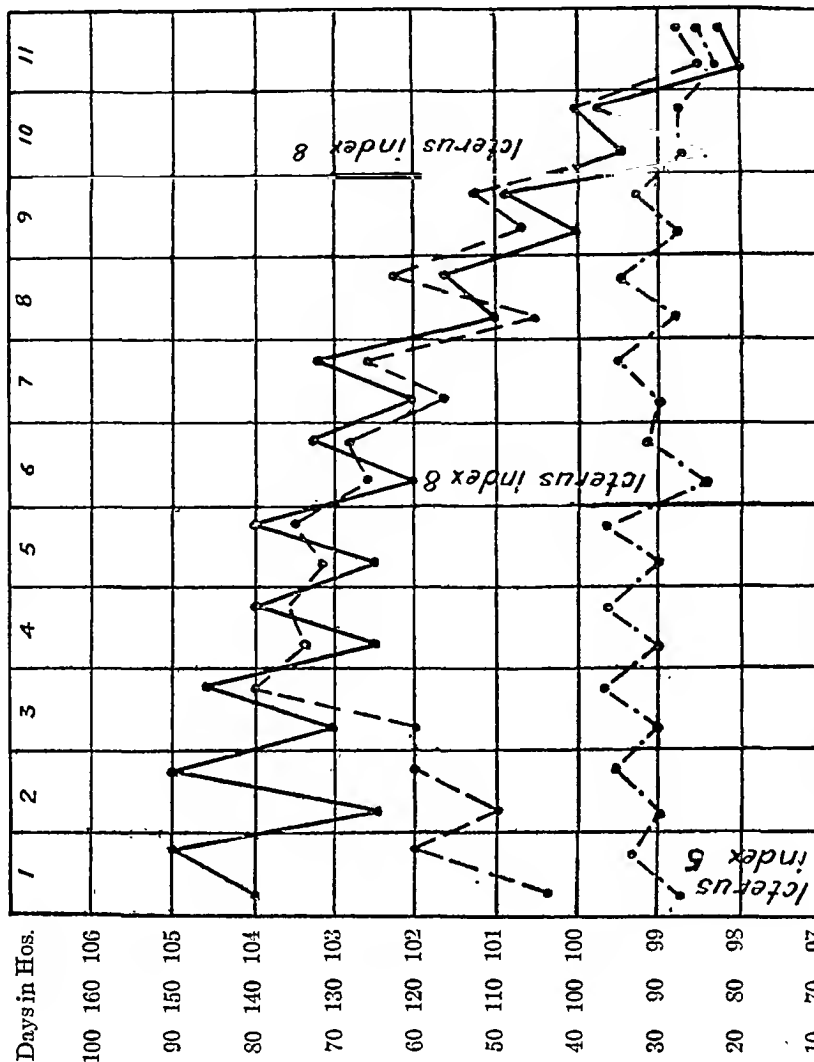
for placing the clinical material at our disposal.

We further take this opportunity to thank Dr. Shujaat Ali, Mr. L. Roop Lal Kapoor, and Dr. Mukhtar Ahmed for their valuable help.

### REFERENCES

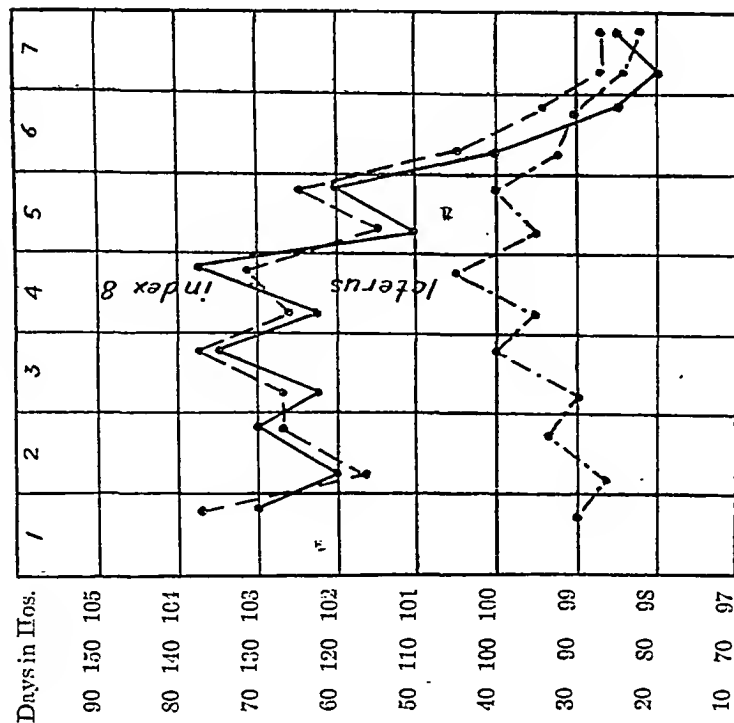
- Howard, C. P. (1936). *The Diagnosis and Treatment of Pneumonia*. Oxford University Press, New York.  
Singh, B. (1936). Some Aspects of Lobar Pneumonia in Adults. *Amritsar Med. School Magazine*, Vol. V, pp. 6 and 11.

CASE 8  
Name.....Indar Singh. H. M. Age.....30 years.



Lobar pneumonia, right base.  
Sputum examination, pneumococci + +.  
Total white cell count = 14,000 per c.mm. blood.  
Differential count:—  
Polymorphonuclears .. 79 per cent.  
Lymphocytes .. 18 "  
Large mononuclears .. 3 "  
Eosinophiles .. 0 "  
No marked toxæmia, no cyanosis detected.

CASE 7  
Name.....Gulam. M. M. Age.....24 years.



Lobar pneumonia, right base.  
Sputum examination, pneumococci + +.  
Differential count:—  
Polymorphonuclears .. 88 per cent.  
Lymphocytes .. 20 "  
Large mononuclears .. 2 "  
Eosinophiles .. 0 "  
No marked toxæmia.  
Cyanosis present on third and fourth days.

cyanosis at the stage of illness when blood was taken for the test. None of these patients died.

(3) There were two atypical cases, both above the age of 50 years. The graphic record of one of these is given here. Their bloods gave icterus indices 17 and 21 respectively. They neither had any marked toxæmia nor cyanosis. Both recovered after suffering from a mild type of the disease. In these cases it is perhaps possible that their livers were damaged otherwise and not by the pneumonia. These cases were admitted to the hospital for some gastrointestinal disturbance and got the attack of lobar

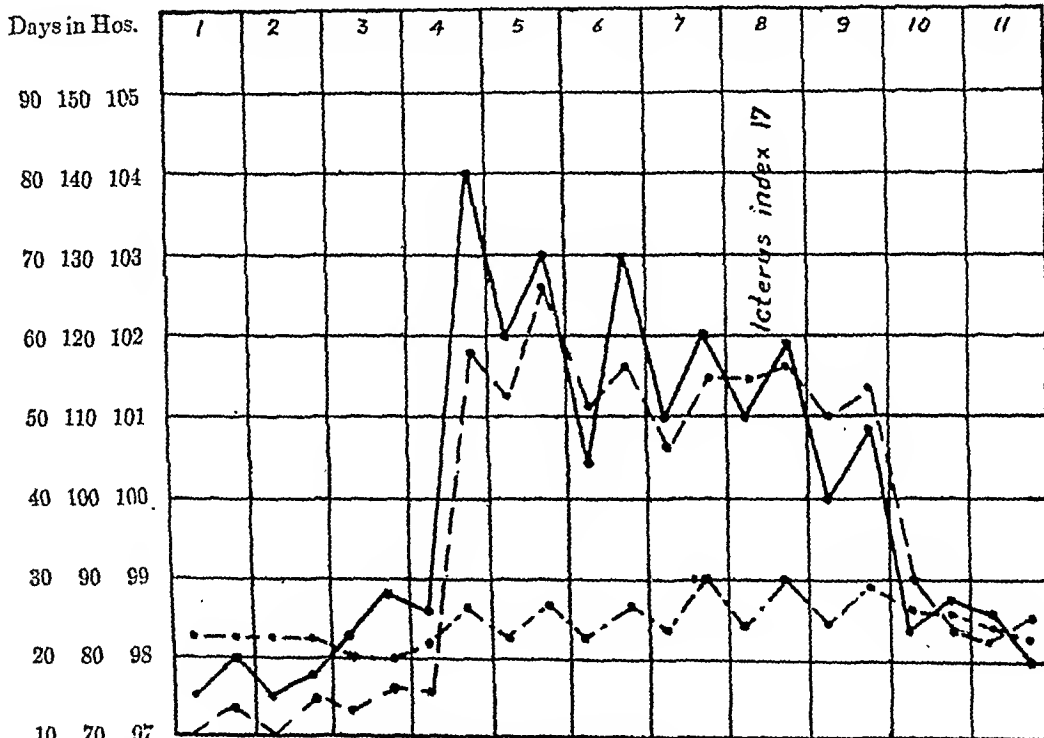
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Lymphocytes .. 37 "  
Large mononuclears .. 1 "  
Eosinophiles .. 0 "  
No marked toxæmia, no cyanosis.

pneumonia after they were in the ward for a few days.

It would appear therefore from this study that the six cases who had marked toxæmia during the illness showed a high index, five without much toxæmia, but some of them with cyanosis had nearly normal indices. The two old cases gave conflicting results.

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### REFERENCES

- Howard, C. P. (1936). *The Diagnosis and Treatment of Pneumonia*. Oxford University Press, New York.  
Singh, B. (1936). Some Aspects of Lobar Pneumonia in Adults. *Amritsar Med. School Magazine*, Vol. V, pp. 6 and 11.

## APPARATUS FOR LEPROSY CLINIC

By A. T. ROY, L.M.F.

*Assistant Medical Officer, Purulia Leper Home and Hospital*

It has been found again and again that visitors to our clinic much appreciated the apparatus from which our injectors usually draw oil before injection. One of the distinguished visitors connected with a number of outdoor clinics even asked us to make a sketch for his use. It has therefore been felt that the publication of this may be helpful to workers specially engaged in dealing with a number of patients.

Figure 1. A container of oil fixed to a retort stand. The outlet of the container is fitted with

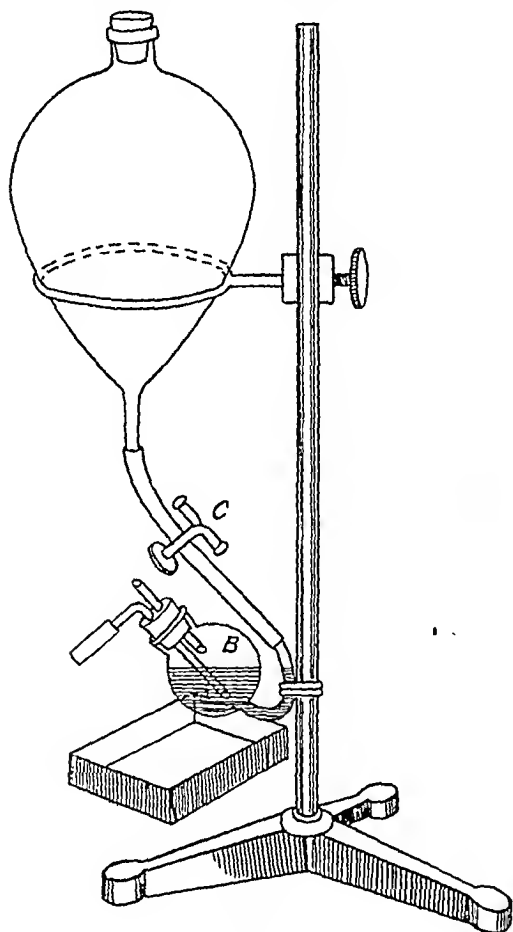


Fig. 1.

B = bulb.  
C = pinch-cock.  
D = douche-can.  
T = top of the spirit drum.

P = thin iron bars.  
R = the iron rod.  
S = spirit drum.

a rubber tubing. The other end of the tube is fitted with a glass bulb (B). In between the ends of the rubber tube a pinch-cock (C) is fitted, which is released to fill the tube. The opening of the bulb is fitted with a cork. Two fine tubes, one bent and another straight, are bored through the cork into the bulb. The straight one for the entry of air may be replaced by a thick-bore needle, and the other is connected with an inch of fine rubber tubing to

which the nozzle of the syringe is easily fitted, to draw the oil. The bulb is secured to the retort stand. The opening of the container should be covered with gauze folded several times to prevent entrance of dust, etc.

The advantage of this apparatus is to avoid waste of oil. One can draw the exact quantity desired for injection.

A modification of the simple and cheap method of Gupta (1934) has also been employed with a view to keeping the oil at a constant temperature. This modification is really a great help where many patients are treated with intra-dermal injection of oil.

Figures 2 and 3. An empty spirit drum made of galvanized iron with the bottom removed was

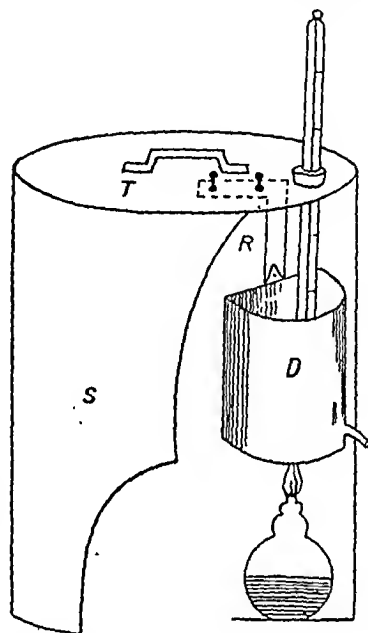


Fig. 2.—Section to show the inner view.

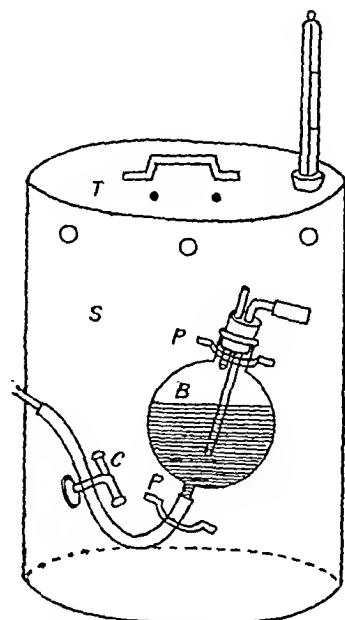


Fig. 3.—Outer view of the drum, shows also the position of the bulb.

(Continued at foot of opposite page)

## A NOTE ON A CHEAP SUBSTITUTE FOR A SHADOWLESS LAMP FOR OPERATION THEATRES

By MIN SEIN, M.B. (Cal.), M.R.C.P. (Lond.)  
CAPTAIN, I.M.S.

*Civil Surgeon, Toungoo, Burma*

WHENEVER electric supply is available it is the ambition of the executive staff of a hospital to secure for its operation theatre one of the modern shadowless lamps. Frequently the funds of a district hospital are not sufficient to meet the ordinary demands made upon it by the upkeep of the hospital quite apart from buying one of these expensive lamps. Thus most of the district hospitals have to carry on operative work at night under the grave disadvantages of one overhead hanging lamp helped perhaps by a hand lamp. The discomforts arising from a powerful electric light close to the back of one's neck for a period of half an hour or longer, entailed by an emergency operation, have to be felt to be realized.

When I visited Dr. Seagrave's Hospital at Namkham in March 1935 I became interested in an overhead cluster of lamps with parabolic lamp shades which he had fitted for the use in the operation theatre. Dr. Seagrave gave me some details of the device. On my return to Bhamo I tried to get a similar model made but was

*(Continued from previous page)*

used. The iron rod (R)  $\frac{1}{2}$  inch by 1 inch by 6 inches was bent at right angles. One arm of it was fixed to the douche-can (D) and the other to the top of the spirit drum (S). This rod may be readily detached for cleaning and sterilizing the can. A hole was made in the drum (S) to permit the nozzle of the douche-can to protrude. A rubber tube was used to connect the ends of the nozzle and the bulb (B), and a pinch-cock fitted to regulate the flow of the oil. The bulb was fitted as in figure 1. A hole was cut in the top (T) where a cork was fitted with a thermometer, which goes far into the oil. This cork, when removed, provides a hole through which a funnel may be passed to introduce fresh oil. The bulb was secured in place by screwing two thin bars (P) to the drum. Three or four holes near the top were made for ventilation.

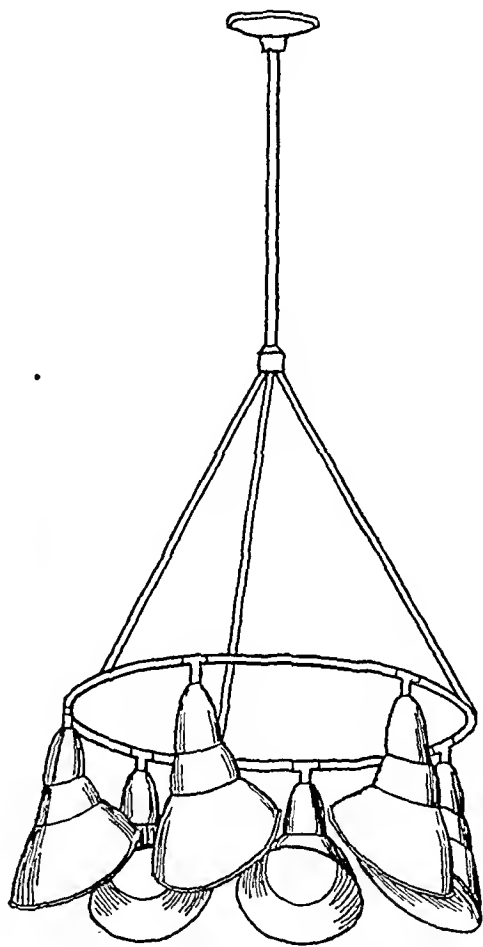
The advantages of the modification are:—

1. The temperature of the oil is constantly regulated and thus the injection of over-heated oil can be avoided.
2. The whole apparatus can be assembled and taken down very easily, and easily moved from place to place.
3. It avoids the waste of oil by permitting the withdrawal of the exact quantity desired for injection.

### REFERENCE

Gupta, K. K. (1934). An Easy Method of keeping Hydnocarpus Oil constantly hot during Injection. *Leprosy in India*. Vol. VI, p. 136.

unsuccessful as the firm which sold the shades had stopped selling them. After my transfer to Toungoo I took the opportunity of communicating my ideas to the representative of Messrs. Stewart Raeburn and Company, Limited, Rangoon, who had come to supervise the renewal of the whole electric installation of Toungoo Civil Hospital. After some experiments with reference to the number of lamps, candle-power of each, and the distance of the lamps from each other and the operation table, the model, as shown in the photograph, was accepted as being very satisfactory from the standpoint of being practically shadowless and brilliant.



It was estimated that the expenditure of current in keeping the lamps lit for one hour does not amount to more than half a unit. The cost of the apparatus is approximately Rs. 89. Thus every district hospital should be able to buy one. All the parts are practically indestructible. The bulbs are of frosted glass and are easily replaceable. We have used the apparatus now for over four months and have found it very satisfactory.

A description of the apparatus is given below. The sketch and photograph will easily make the points clear.

There are six electric bulbs of frosted glass of 50 candle-power each attached to metal parabolic

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## A NOTE ON HEALTH UNIT WORK

By W. P. JACOCKS, M.D., D.P.H.

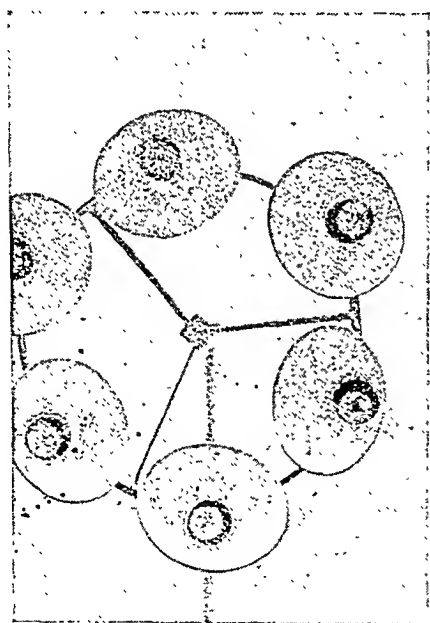
Delhi

### Introduction

HEALTH unit work is gradually spreading in India. There are now five organizations in

(Continued from previous page)

shades thickly enamelled in white both outside and inside. These are fixed to a ring of aluminium tubing inside which the electric wires run. This ring is suspended by a long tube from the ceiling by means of a frame. The lamps are equi-distant from each other and the diameter of the ring is 31 inches. The height of the lamps from the operation table is four feet. The raising or lowering of the table does not appreciably alter the illumination of the apparatus. Those who are expert in optics might be able to adjust the various distances to a better precision and more lamps of lesser candle-power might be tried.



In Burma most district towns have independent electric supply and advantage might be taken to install the lamp described in each hospital.

The lamp could also be installed in smaller hospitals in India and also in military hospitals.

Messrs. Stewart Raeburn and Company, Limited, Rangoon, were responsible for the setting up of the lamp described in this article, but any firm which specializes in electric installation would be able to fit up the lamp.

### Summary

A practical method of providing a cheap form of shadowless lamp is described.

Its adoption in smaller hospitals is recommended.

operation in various parts of the country and this number is being added to each year. As this type of work represents the most satisfactory approach to rural health work yet suggested, the fundamentals should be of interest to those who are responsible for rural health.

There are more than five hundred health unit organizations in operation in various parts of the world. Chellappah (1926 and 1928) and Jacocks (1933) described the underlying principles of health unit work as carried out in Ceylon. In this short note some of the original points are again stressed and emphasis is placed on some recent developments which have been gained by experience.

### Object

In simple terms health unit work is an attempt by the public health department to introduce recognized health procedures into rural and semi-rural areas by adjusting the number of workers to the populations concerned. This is a common-sense procedure which is practised in any satisfactorily conducted business. The objects are:—

- (a) To carry out sound health work of all types in a selected area.
- (b) To demonstrate modern methods of practical approach to health problems which might be applied generally.
- (c) To develop a field training centre for all grades of public health personnel in the department.
- (d) To set up a model organization which could be closely studied by officials and technical visitors.

It is not the intention to advocate the establishment of health units throughout the entire area of any province or state. This procedure has not been carried out in any part of the world and is impracticable for many reasons. The plan which provincial and state authorities in India might have in mind in the beginning is the establishment of *one* organization which could be used as a demonstration of methods and in which the provincial public health workers of all grades would have an opportunity to receive practical training in field procedures. It could be decided later whether or not more than one unit would be desirable in large and populous provinces.

### First unit

A successful public health organization is found whenever the co-operation of the people concerned is freely and fully given. For this and other reasons the first unit should be started in an area in which the people will give the assistance which is needed to carry out successful health work.

The first unit is to be the demonstration area; it should be located near the central government in order that it would be easily accessible to busy administrators and that its development

could be carefully supervised. The first area is to be the training area; it should be staffed by workers with the best available training. As the work is a part of the general health scheme of the country, it is advantageous for the first unit to be located in an area in which there is a hospital or dispensary. Good roads are desirable in order that the staff may be able to reach the people frequently and easily, and an energetic and resourceful health officer is essential as he is in charge of the work and is responsible for its success.

#### *Population and area*

It is now agreed that a population of 40,000 is the most satisfactory number of people to deal with in the beginning. This figure is sufficient to keep the medical officer of health fully occupied. Experience has shown that one sanitary inspector can do satisfactory work with a population not exceeding 10,000; one health visitor can deal with a similar number; one midwife can look after 5,000 people.

The area is subdivided into four parts of 10,000 people each and one-fourth of the staff lives in each subdivision. The medical officer of health and the assistant medical officer live in the headquarters subdivision. The area and the number of villages dealt with is determined by the population density.

#### *Personnel*

A standard staff for an initial health unit organization consists of one medical officer of health, one medical officer (a lady doctor if the purdah system prevails), four sanitary inspectors, four health visitors (preferably with full nursing training), eight midwives, one clerk and menials as required. This staff is fully trained in health unit principles as well as in vaccination and in the mass administration of quinine and vermifuges and will carry out all public health work in the area. No other trained workers are required, except visits by experts to define problems and outline procedures.

#### *Training*

It is generally agreed that special work requires special training. For that reason it would be incorrect to say that any medically qualified person can do public health work for he would lack special training. Health unit work is a new method of rural work and requires a new method of training. It can be stated with confidence that health unit work cannot be done unless the personnel is trained in health unit procedures. Well-organized health unit work can now be studied in Ceylon and in India.

It is not enough to say that any medical officer of health can do health work successfully after he has received training. Failures have occurred. The successful health officer is one with medical and public health education and whose outlook in respect to the people is kind, sympathetic and social, and who is endowed with character,

energy and initiative. Health units have been graded in respect of the qualities which the medical officer of health possesses and which he puts into practice through his own efforts and those of his staff.

#### *Activities*

All recognized public health activities are carried out by health unit organizations. A few items only are mentioned.

It is necessary first to survey the area to determine its environmental sanitary condition and to learn the diseases which are the principal causes of death and to set a base line for future reference. The survey is done on a special form by members of the staff. In addition to the public health knowledge so gained the survey will enable the staff to become acquainted with the people and the people with them and this is important.

When the survey has been completed and the data analysed a programme of procedure based on the survey findings is prepared. The programmes are drawn up in advance weekly, monthly and yearly. If the survey should reveal that malaria is a major problem which required early attention, malaria experts would be asked to define the problem and suggest methods of control and these methods, unless too technical, would be put into practice by the health unit staff, according to the programme prepared.

Health unit clinics deal with those who are well and endeavour to keep them well. The procedure in well-baby clinics of weighing, measuring, lecturing and demonstrating is now well standardized.

Clinics are held weekly. It would be advantageous to decide early whether or not fortnightly clinics would be sufficient. If so, the number of clinics could be doubled. It is preferable to have as many clinics as possible distributed in as many villages as possible as this arrangement would reduce the distance which the people are required to travel to reach clinics.

The health visitor is responsible for the attendance at well-baby clinics of infants and mothers. Modern public health work is not satisfied with home visits paid only to those cases which come to the clinic. Every home in the assigned area is visited at stated periods.

Attendance at the clinics should be based on sound public health reasons which the mothers can understand. If attendance is built upon the hope of drugs, food or gifts the whole object of health work is obscured. It is far better to begin with a few mothers who understand that clinics are for the sole purpose of keeping the mother and child well and vigorous. This is a sufficient reason if it is clearly explained and emphasized in the beginning.

The midwife works under the immediate direction of the health visitor. She is expected to make routine visits to all mothers in her assigned territory. She should know the names of all expectant mothers; she is responsible for bringing

them to the clinic or to the attention of the health visitor or medical officer of health; she attends the mother when the child is born.

To get the best results *pre-natal* clinics should be held separately from the well-baby clinics. The expectant mother hesitates to come to a combined clinic. The examination which is made, and the instruction which she receives, is specific and has some but not much reference to the other clinic procedures. Experience has shown that clinic attendance by expectant mothers has greatly increased when the clinics were held separately.

Pre-natal work must start early in the pregnancy if the maternal and infancy deaths are to be reduced. An examination of the cards at many clinics will reveal that the expectant mother is usually not seen till the 8th or 9th month by which time any damage which the pregnancy has caused is already well advanced. The pre-natal card should have a column showing the months of pregnancy. Notations regarding visits should be recorded in the proper month of pregnancy column; that is, if the first visit is made in the 5th month of pregnancy the record should be in the 5th month column. This arrangement enables the health officer to see at a glance whether or not the mothers are being reached early in pregnancy.

It would be a good plan if the expectant mother could be told by the medical officer at her first examination the dates on which she should come to the clinic and on which she should be seen at home. Attendance at the clinic has many advantages for the mother but it may not be practicable for her to come long distances in the later months.

It might be well to repeat that clinics are for the purpose of dealing with well people. It is not good practice for children who are ill with contagious diseases to assemble with those who are well at post-natal and pre-school clinics. If children are ill they should be taken or sent to the dispensary for the necessary medicines.

It is not a routine procedure to give drugs at clinics as this would only duplicate existing treatment facilities, but emergency treatment is always given. It has been shown to be far better for health visitors to give demonstrations in the homes to mothers in respect to the treatment of scabies and pediculosis, in first aid and other simple and similar procedures. Mass treatment for hookworm and malaria is a part of the regular programme if these diseases are important health problems in the area.

#### *Weekly conferences*

One of the most satisfactory developments in health unit work is the weekly assembling on Saturday mornings at the central office of all the staff for a general discussion of problems common to the staff and for decisions concerning these problems. The conference enables each member of the staff to view the work as a whole and thus to enlarge his view-point and interest.

If the occasion arises the conference time can be used to hear a lecture by one of the staff or by a visitor. The weekly conference is such an important activity of the work that it cannot be neglected.

At the conference the preparation of advance programmes for the following week are considered.

#### *Compulsion*

Every public health department should have a legal code for use when necessary but if a health official depends on prosecuting people to obtain his ends his view-point is not in sympathy with sound health unit principles. Prosecution involves the repeated attendance at court by the officer and keeps him away from his proper duties; it makes enemies and accomplishes little in comparison with the time and energy used.

It is possible for good work to be carried out from year to year without prosecutions. In fact it is desirable not to use legal powers. If co-operation is not attained by persuasion the medical officer of health should feel that he has failed to achieve his full object.

#### *Local support*

No public health organization is able of itself to do all necessary health work in any area in India or in any other country in the world. All successful health work is based on willing assistance given by the people. The help of the people should be earnestly sought and obtained by the medical officer of health and by all the members of the staff through personal visits and talks, lectures by cinema and lantern and through explaining in detail the plan of work and the reasons for it. It is expected that each member of the staff will become well acquainted with and gain the confidence of the people of his assigned area. When that is done the villager will join in and do his share. If he contributes even a little he will feel a personal interest in and responsibility for making the work a success.

The methods in which the villagers can co-operate are many. One of the best is to arrange through a member of the health unit staff, usually the sanitary inspector for each village, to form itself into a small health organization often called a *health league* and by means of the league take charge of and complete a series of village health problems. The membership of the league is the total population of the village but each league has its chairman and a small executive committee which meets regularly and records its actions in a minute book. The league is provided by the health unit staff with a list of the health problems of the area and the order of their importance.

Health leagues should be started slowly. Each organization should be perfected and the work well organized before the next league is formed.

It is not advisable for the league to carry on more than one activity at the time, and each activity should be completed before the next one

is undertaken. If this idea is adhered to, it follows that the villager will complete his tasks thus avoiding the all too common custom of starting many activities and of completing none. The people in several villages have already learned through health leagues that if the entire population, youngest to oldest, is vaccinated successfully they can dismiss the fear of smallpox from their minds for several years.

The leagues seem to offer to the villager a suitable method of attacking his sanitary environmental problems and the experience already gained indicates that the people will willingly undertake to work out their health problems by means of leagues.

### Summary

A few of the underlying health unit principles are discussed in respect to objects, population, selection of area, training and clinic activities. The use of village health leagues is emphasized.

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## A Mirror of Hospital Practice

### BACTERIUM PSEUDO-CAROLINUS INFECTION OF THE BLADDER

By L. R. SHARMA, M.B., B.S., D.P.H. (Camb.),  
D.T.M. & H. (Camb.), M.R.C.P. (Edin.)

Pathologist to Bowring and Lady Curzon Hospitals,  
Bangalore

*Bacterium pseudo-carolinus*, though described by Castellani as early as 1917 (Castellani and Chalmers, 1919), only came into prominence as a result of the work of Acton (1928 and 1929) and Acton and Knowles (1928) perhaps due to the frequency of this organism in the faeces of sprue and chronic dysentery cases treated by them. Acton (1930 and 1931) and Chopra and Chaudhuri (1934) suggested the pathogenicity of the bacterium by the excellent results they got from its use as a vaccine, and Pasricha (1931) corroborated it by establishing its antigenic relation to *Bact. flexneri* through the action of bacteriophage.

**History.**—Mrs. A., a European pensioner, aged 72, was admitted to St. Martha's Hospital, on 3rd October, 1935, complaining of pain and frequency of micturition and weakness. She had been running a low intermittent temperature of 99°F. to 100°F. as the maximum.

**Pathological findings:** *Urine.*—5th October, reaction acid, albumin+ and pus cells+. The organism isolated on culture was found to be a non-motile, Gram-negative bacillus fermenting glucose, mannite and maltose with formation of acid and gas and fermented dextrose with acid and gas after 72 hours' incubation. Lactose, saccharose and dextrin were not fermented. On these morphological and biochemical reactions the isolated bacterium was identified as *pseudo-carolinus*. On 10th October, another catheter specimen of urine was cultured with similar result. The third culture on 6th November (i.e., after the 6th dose of auto-vaccine) resulted in ten colonies of the same organism after 24 hours. After the course of 12 injections two more specimens were cultured (24th and 25th November) with negative results after 72 hours' incubation of the plates.

**Stools.**—Three specimens of stools were examined and cultured at different stages of the illness with negative results.

**Treatment.**—Patient was put to bed on liquid diet which was gradually increased towards the end of the illness. The patient was given potassium citrate and

tincture hyoscyamus for three days; other medicines given were mist. alba and mist. triple bromide when indicated.

Autogenous vaccine prepared from *Bact. pseudo-carolinus* isolated from the urine was started with one million and gradually increased to 75 millions, being extended over a course of 12 injections given every fourth day.

(Note.—The writer considers that better results are obtained by starting the vaccine with comparatively small doses, and extending the course to 12 injections, by gradual increase in each dose without producing reaction rather than by pushing up to the maximum in a short course and running the risk of reaction.)

**Progress.**—The patient made an uneventful recovery, except for an attack of dengue lasting from 27th October to 2nd November. After the sixth injection of autogenous vaccine (35 millions) the patient showed signs of improvement and at the end of the course appeared completely cured, and her weight increased from 121 lb. on admission to 128 lb.

### Discussion

The writer can find no reference in the literature about the isolation of *Bact. pseudo-carolinus* from the urine. The case here cited shows two important features:

- (1) that the bacillus was present in the urine on repeated culture; and
- (2) that the bacillus was absent in the stools on repeated culture.

The question arises, is the infection of the bladder by the bacterium primary, or secondary? Three negative cultures of stools—two before, and one during vaccine therapy—almost rule out the secondary infection in this case, although the only source of *Bact. pseudo-carolinus* so far known is the intestines. Therefore, primary infection of the bladder in this case may be accepted because:

- (i) the organism was found in the urine alone and in pure form;
  - (ii) it was absent from the stools; and
  - (iii) it completely disappeared from the urine after autogenous vaccine therapy.
- The identity of the isolated strain was established from its morphology, cultural

characters and biochemical reactions which resembled those of *Bact. pseudo-carolinus*. No agglutinating serum is so far available; and, according to Pasricha (personal communication), '*Bact. pseudo-carolinus* is not homogeneous in its serological reactions and a serum from any one strain is of very limited value'.

### Summary

1. *Bact. pseudo-carolinus* does not only attack the intestines but may attack the urinary tract also.

2. In the case described above there is primary infection of the bladder; but otherwise, secondary infection of *Bact. pseudo-carolinus* of urinary tract, in general, is not improbable.

3. *Bact. pseudo-carolinus* is a pathogenic organism and its specific vaccine is effective.

In conclusion, my thanks are due to Lieut.-Colonel J. B. Hance, I.M.S., for valuable suggestions and permission to publish this note, and my indebtedness to Major J. G. McCann, I.M.S., for kindly allowing me to utilize the clinical notes of his case.

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- Note.—In the absence of serial stool examination on consecutive days it is difficult to rule out conclusively the bowel infection with the bacterium.—Editor, I. M. G.

## A CASE OF ECTOPIC GESTATION COMPLICATED BY A COEXISTENT UNRELATED PELVIC ABSCESS

By R. DE SOLDENHOFF

CAPTAIN, I.M.S.

Resident Medical Officer, St. George's Hospital, Bombay

**History.**—A widow, aged 34 years, was admitted to hospital on the 2nd March, 1937. Her last period had been on the 8th January but about ten days before admission she had had pain in the abdomen and vaginal bleeding, this had increased and for the last five days she had fever. She had always been well previously, always been regular in her periods, had had four children and two miscarriages.

On admission she had a temperature of 103°F., pulse of 120 and she was extremely tender all over the lower abdomen. Vaginal examination revealed an indefinite mass in the pouch of Douglas filling the right fornix as well, the uterus could not be defined, the external os was closed. A diagnosis was made of a completed abortion, probably self-procured, with subsequent sepsis and the formation of a pelvic abscess.

She was treated in the high Fowler's position and given nothing but water by mouth and fomentos to the abdomen.

Four days later she was examined under anaesthesia so that, if necessary, a posterior colpotomy could be done.

The mass had increased in size and was mainly in the right fornix and anteriorly the uterus could be made out; the left side appeared clear. The mass was so hard that a colpotomy was not done. The patient's condition had improved though she was still running a high temperature and her white blood count was 19,000. The temperature did not fall and now the mass was palpable above the pubis, so four days after the examination a posterior colpotomy was done under anaesthesia.

A large amount of foul pus was evacuated and a T tube stitched in. Her temperature settled and seven days later the tube was removed. The mass in the right fornix had almost disappeared but as there was still a good deal of discharge the tube was put back and the patient allowed to move about with the tube in position; this did not cause her any inconvenience and certainly helped drainage. The tube was removed in another five days and the patient seemed to be getting well.

A few days after this she complained of pain in the left side and a mass could now be felt in the left fornix very like a pus tube, though now she was running no temperature. It was thought that perhaps the original source of the trouble was that the tube had been tapped but was now filling up again, though this time in the form of a hydro-salpinx.

As her temperature was normal and her general condition good it was decided to remove the tube abdominally and she was operated on under spinal anaesthesia on the 6th April, a month after the colpotomy. At the operation the mass was found firmly adherent to the posterior surface of the uterus and in the bottom of the pouch of Douglas. Its main constituent was obviously blood and one realized at once that it was an ectopic pregnancy.

It readily peeled off the uterus and was brought out of the pelvis; it needed ligatures as no pedicles could be found. The right tube was removed as it showed chronic inflammatory change, the raw areas were peritonized with the round ligaments, which served at the same time to sling the uterus forward in an anteverted position.

She made an uninterrupted recovery and was discharged 18 days after the operation. Her pelvis was clear with the uterus mobile and in good position.

The specimen consisted mainly of blood clot, in which a disorganized tube was found, and a separate cystic swelling inside the clot was found to contain a foetus of about 8 to 9 weeks, attached by its umbilical cord to an early placenta, this latter was firmly adherent to the ovary.

The explanation I consider was that it was a case of pseudoligamentary gestation, where the foetus had, with its gestation sac after tubal abortion, become attached to the ovary and the posterior leaf of the broad ligament.

The particular interest of this case was the fact that there were two separate clinical entities, the formation of the pelvic abscess due to sepsis following on interference, as the woman had realized that she was pregnant and tried to abort an empty uterus. The foetus in the tube had evidently lived through this, only to go on to abortion and a further existence attached to the ovary and broad ligament.

These cases are not common though a series has been reported in Soviet Russia.



# Indian Medical Gazette

SEPTEMBER

## PUBLIC HEALTH PROPAGANDA AND EDUCATION

THE consciousness of most governments to-day is fully aroused to the importance of applying for the benefit of the citizens of their countries the knowledge that has so rapidly accumulated during recent years, and is still accumulating, in practically all matters relating to improvement in health and the reduction of disease incidence.

India is well to the fore in this respect and we draw the attention of our readers to a report which appears elsewhere in this issue on the first meeting of the newly constituted, or as is indicated in the historical outline at the beginning of the report, what is perhaps more truly a revived Central Advisory Board of Health. A board constituted as this one is, cannot fail to be of immense value to India in co-ordinating health organization, because from the point of view of internal administration India, with its many separately governed provinces and states, is in reality a commonwealth of nations and it is only under the direction of such a central advisory body as the one just formed that a uniform public health policy for the whole country can be formulated and put into operation.

The board is going to pay special attention to the study of nutrition, because correct feeding is now everywhere recognized to be the principal factor in building up the resistance of the individual to disease. For improving the diet of the millions in India who are in need of better feeding, the nutrition inquiry under the Indian Research Fund Association is playing and will continue to play the major part. When it began many years ago under Sir Robert McCarrison it is doubtful if anyone realized how quickly would evolve, from what in the beginning appeared to be largely an academic research, an inquiry of such intense practical value as it is to-day, and India is fortunate in the possession of such an active and well-organized unit as the nutritional research unit is to-day under its director Dr. Aykroyd.

In addition to the study of public health problems from the national point of view the international outlook is also of great importance, and the League of Nations has been instrumental in encouraging this wider view, and as evidence of their influence in our own sphere we recall to our readers the fact that as we go to press a conference instigated by this body is being held in Java. Here all the important countries of the East are represented and India has sent a strong delegation. A great deal of

good should emerge from such a conference and co-operation should be greatly strengthened between these densely peopled countries whose numbers account for about half the total population of the world. But although we anticipate much from this meeting and the delegates will return to their own countries with a widened vision and better understanding of the special difficulties of their neighbours, and how they will be able to help or hinder one another in their efforts to raise and maintain a higher standard of health throughout the world, the ultimate spread of this knowledge must be to the individual, often living in a remote village and usually ignorant and illiterate, before the real benefits we hope for will accrue.

One of the great problems of the public health administrator of the present day is to pass on to the poor and ignorant rural population the considerable amount of knowledge we now have at our disposal for improvement in health and prevention of disease. These problems are on the whole more difficult in the tropics than in the temperate zones for several reasons, a few of which we give below.

The numbers of people to be educated in health principles are greater and their general education is of a lower standard than that of the people in the temperate zones. The less rigorous climate has never encouraged the inhabitants of the tropics to improve to any real extent on the primitive huts that were devised by their forefathers. The higher temperatures encourage the existence of disease germs during the extra-corporeal portion of their cycle, and the climate also leads to the prolific multiplication of the insect vectors of many of these diseases. Communications in these vast primitive countries have in the past been difficult, and in the present are still far from easy in many places, so that the new knowledge has of necessity been slow in reaching the remote villages.

Another very important check on the spread of scientific knowledge in health preservation and prevention is that the precepts one has to instil are often opposed to age-old religious beliefs and customs. This means that after the primitive villager has been reached by the health missionaries he must be carefully and patiently led along the new path it is desired he shall follow.

From what we have written it is clear that the Government of India is actively proceeding in the establishment of administrative machinery whereby to spread public health knowledge throughout the land, and this is of course a very necessary preliminary measure if success is to be achieved and when achieved it is to last. The detail of how the individual is to be reached and taught most effectively, has still to be considered.

Many schemes for the inculcation of health principles have been advocated from time to time and better and better methods are gradually



evolving. In our present number we have a short article contributed by the representative in India of that great organization the Rockefeller Foundation, whose name is known throughout the world as one of the great factors in modern public health propaganda and education. This article outlines the organization of what is known as a 'health unit', and this appeals to us as one of the best means of reaching effectively the isolated villages.

An area where the people are possibly more sophisticated is selected in the centre of a large district and health work on a properly organized basis is carried out. The benefits deriving from

the work at this centre will become obvious to the inhabitants of the surrounding districts and in this way the sanitary conscience will be gradually awakened, and outlying communities will become ready and possibly even anxious to do the same thing in their own villages. This method is of course slow but it appeals to us in apparently having the merit of being sure, and as the people are taught and not forced to do what is necessary they become interested and enthusiastic so that in the course of time they will largely carry out their own public health measures with little administrative control or coercion.

## Special Article

### HEAD INJURIES

#### A CLINICAL LECTURE

By A. T. ANDREASEN

CAPTAIN, I.M.S.

*Specialist in Surgery, P. and A. District*

THE subject of my lecture to-day is a vast one. I will treat but a small portion of the subject, always endeavouring to give you a sound basis to work from in your consideration of these cases, in so far as they may concern you.

You no doubt imagine that anything to do with the diagnosis and treatment of injuries of the head must be very modern, connected with x-rays, ventricular puncture, and surgeons specialized in operations on the head. The impression is false, for as long ago as 3,000 and 2,500 years before Christ, a surgeon living in Egypt fully described their treatment. No doubt accidents occurring during the building of the pyramids provided him with many such cases. In one of these pyramids was found the now famous Edwin Smith Papyrus, which, when translated, brought to light the astonishing fact that the treatment and care of the cases was just as thorough then as it is now in our most modern surgical clinic.

In 490 B.C., Hippocrates wrote a book giving full instructions to the surgeon on the treatment of injuries of the skull and brain.

It was not until the beginning of the seventeenth century that surgery recovered sufficiently from the turmoil and religious oppression of the Middle Ages to recommence making strides.

From then until the present time the names of such great men as Pott, the Hunter Brothers, Cooper, Lister, and more recently Jackson, Horsley, Cushing, Dandy, and Martel, are associated with the remarkable advances that have been made since those early days. Do not think that these advances have changed the problems which face us—these remain for all time—each case is a mystery to be solved; it

presents its clues which, if followed up correctly, will lead to the solution of that particular mystery. What these advances have done is to give us more ways of attack on the problems which present themselves; sometimes a way of even putting the trouble in order. But even with these ingenious extra helps there is no short cut. We must observe a rigid routine in the examination of these cases, using to the full all our powers of observation and deduction before thinking of using any other instruments. Those of us who may be too stiff-necked to follow such a method, invariably fail to produce any useful result.

The surgical anatomy of the skull is intricate, and I do not propose to go into any detail here. Suffice it to say that upon your knowledge of the anatomy of the skull depends the exact diagnosis of the head injury with which you may be confronted.

Much more important is your concept of the elementary physiology of the skull, for upon this depends your understanding and diagnosis of the conditions of concussion, compression, or contusion.

Let us consider the brain, for a moment, as one of the encapsuled organs. This is an unusual description of the brain, but it permits us more easily to envisage some interesting aspects of the functional relationship of the brain to its skeleton, the skull.

A moment's thought will bring us to the conclusion that it is in the matter of rigidity that the various organ capsules differ, and that on this character they may be classified into three groups:—

In the first group, the capsule is fully extensible; the kidney and the spleen belong to this group.

The second group, exemplified by the testis, has only partially extensible capsules.

The third group, represented by the brain with its capsule the skull, has a non-extensible covering.

This variation in the rigidity of the capsules in these groups will of necessity modify considerably the mechanics of the circulation of the different organs, under given conditions. There is, of course, a primary need for the flow of blood to be continuous, through any tissue, and in the first two groups the extensibility of the capsule allows pulsation and elastic recoil to occur. But in the case of the brain, the mechanism must be different, because the capsule of this organ is unyielding. Therefore, as at each pulsation the brain expands and the skull does not, then room must be made for the pulsation to occur by the expulsion of an equal quantity or volume of the low-pressure intra-cranial fluids. This is why the veins leaving the skull and the cerebro-spinal fluid in the sub-arachnoid space of the spinal cord show arterial pulsation.

The mechanism is adequate, but the margin is very small. After violent exercise when the pulsations in the brain are at their widest normal excursion, we are apt to be aware of an unpleasant thudding in the head which indicates that the brain can only just find room for its circulatory excursions. Again, if one has a slight headache, it is at once aggravated by exertion.

This circulatory peculiarity is fundamental in any consideration of cerebral pathology; it is possible to say that, leaving out destructive lesions, all cerebral symptoms are of circulatory origin.

We will briefly consider how this comes about. Each arterial pulsation is accompanied by an outflow of the low-pressure fluids, chiefly in the form of venous blood. For this to occur, the flow in the veins must be absolutely free. Now, since the pressure in the veins is very low, the slightest swelling in the brain, or part of it, will at once cause a collapse of the veins, and a consequent obstruction of a greater or lesser venous territory. The vicious cycle thus commenced is added to by the swelling now occurring from venous congestion, and so on, the disturbance of function becoming progressive. The brain is thus uniquely sensitive to very slight changes in its bulk.

When an organ like the kidney is bruised and swells, it matters very little how soon, if ever, it gets back to its normal size. When the brain has been bruised, it must get back to its normal size or its circulation will remain permanently disturbed. A simple bruise, of no ultimate importance to an organ with a yielding capsule, is thus a relatively serious matter with the brain. The great difficulty with which the brain recovers from even simple injuries is one of the most important functional consequences of its rigid encapsulation by the skull.

There is still extant a traditional reverence for the ancient delusion that the fracture of the skull is the lesion of most importance. We have all had cases of head injury under our care. A skiagram of the skull is taken at the first opportunity. After inspection by the radiologist and

by the doctor in charge of the case, a sigh of relief is heaved—there is no fracture!—and the less wary of us rock our minds to sleep in that cradle of insecurity until perhaps it is too late to avert the catastrophe. Fracture of the skull is usually an insignificant element of a head injury.

The mechanical significance of the fracture of the skull is simply this—the skull has been distorted until the limit of its elasticity has been passed. It is this distortion, and not the crack in the material of the skull, which is of importance.

Immediate and dramatic effects are not always produced, and because of this and the superstition about the significance of fracture, it is apt to be assumed that the average cranium is on the whole a very satisfactory protective to the brain inside. Since the nature of the so-called minor head injuries has been more completely understood, faith in this beneficent fortitude of the skull has been considerably shaken. We now know that the skull is only moderately effective in its protective function, and quite considerable degrees of distortion may be caused by only slight external violence. Local violence may cause local bending and permit of localized bruising of the brain underneath.

Under the condition of more severe external force being momentarily applied, a far more serious general distortion may occur always—with or without fracture. This general distortion causes the very interesting instantaneous and transient paralysis known as concussion of the brain. There is likely to be produced a widespread bruising of the brain substance that is of great practical importance.

It is of importance to note that, all the evidence would lead to the conclusion that actual distortion of the skull is the immediate cause of most, if not all, of the injuries of the brain. There is no evidence for the belief that injury may be produced by the brain being thrown about inside the undistorted skull as the result of some external violence. No distortion, no brain injury, is probably true.

This liability to distortion would appear to be a racial variant. For instance, the willingness of the negro to use his head as a battering ram, is well known, and it is said that an experienced American policeman will use his truncheon on the head of a negro less hopefully than he would use it upon the head of a white man. As far as my experience goes, the head of the average Hindustani comes intermediate between these extremes of the scale. There are many variants in this country—there are many races and many mixtures. It appears fairly clear then, that in some races the resistance is fairly high, and that there is a tendency for the more highly civilized races to be less resistant.

It will be noticed that, so far, we have not once concerned ourselves with the anatomy of the skull, either topographical or developmental. It may or may not be possible to show a

difference in the thickness or rigidity of European and negro skulls, but, when the far more delicate test of function is applied, there seems to be a demonstrable difference. In the one, the protective function is satisfactory; in the other, the protective function has become impaired, and the physiological disadvantages are fully manifest.

Can this present disadvantageous functional relationship of brain and skull be the result of some strong evolutionary tendency? And if it is so, then what is the advantage which compensates for it?

When the modern European's cranium is compared with those of his ancestors, it is found to be remarkably light and thin. It is not improbable therefore that this tendency towards reduction of massiveness is an inherent character of the race and is progressive. It is natural now for you to ask how far such a process could conceivably go. It may even occur to you to ask if a rigid cranium is a necessary structure.

Without any other consideration but that of function, a very definite answer can be given. However, much more of its protective massiveness may be lost, it must always preserve sufficient rigidity to keep its form, because the skull must maintain its functional relationship with the brain, *i.e.*, that of a skeleton to the brain.

Since the great war, wherein so many head injuries occurred, many observations have been made on those who survived. Those who suffered loss of a part of their brain skeleton, when seen standing, show greater or lesser depressions where the loss of bone has occurred. In the large deficiencies the soft tissues may be found to be one and half inches below the remainder of the surface. Observe the same cases when lying down and you will see that the concavity has disappeared, the soft tissues having filled the gap. You will find that the larger the opening, the greater the depression when standing. Question one of these men and you will be told that sudden exaggerated movements, such as change of posture, cause severe suffering. You will also be told that changes in atmospheric pressure affect them very much. Now there are others, in whom the breach of continuity of the skull has been closed by some skilful surgeon, these will tell you that they now do not suffer from any symptoms, as they used to.

In point of fact, the skull forms the neatest possible solution to the problem of how to support such a large mass of soft tissue. It is an exo-skeleton exploited in a remarkably ingenious way, which is worthy of a moment's consideration.

The other obvious way of supporting a large mass of soft consistency would be to provide it with a stiff connective tissue stroma. Now, were this even possible, it would mean that every fibre would have to be provided with a coat such as is provided for each cerebral vessel—the so-called perivascular lymphatic. And that would have to be continued to the very finest of its

ramifications. This would at least double the bulk of the whole organ. The presence of this fibrous tissue would enormously add to the complication of intercommunication, which is the essence of the brain as it is.

Actually, as the arrangements are, the brain, made up of almost entirely functional elements, is of reasonable size and is kept within bounds by the exo-skeleton, the skull.

After these interesting diversions into the function of the skull in relation to the brain, let us now consider the actual practice of treating head injuries, and apply where possible the principles learnt in our discussion.

The accident happens, the on-lookers or relatives, if there at the time, rush in upon you and clamour for something to be done at once. If you have the fortune not to live close to a road point where accidents are likely to occur, then you will surely be summoned to your hospital to treat the case. Both of which sudden calls will be likely to disturb your calm and upset your judgment. Go quickly to see the cases, but refuse to be rushed into doing anything without first carefully examining them, and then make up your mind as to what the exact condition is with which you are faced.

The patient lies unconscious and pale, arms and legs are inert, eyelids drooping, the eyes unseeing, both pupils dilated and sluggish, the pulse rapid and small. Such is the picture of concussion, a condition of temporary suspension of cerebral functions, following immediately on the injury, and lasting a variable time, but with recovery in twenty-four hours. It follows directly on the infliction of that degree of distortion of the skull which would cause a momentary compression of the brain. There is displacement of the cerebro-spinal fluid and blood from the veins, and the condition before us is due to the consequent anæmia of the brain.

Recovery begins from the medullary centres upwards, and is usually initiated by the reflex act of vomiting, the other functions recovering more gradually. There is complete amnesia for the period of unconsciousness.

It is of importance at the stage before us to submit the patient to skilled, methodical, and competent medical care. Hurry nothing and carry out a rigid routine always. Have the man undressed and put to bed. Cut the hair off. Whilst this is being done, employ your time in getting the story of the accident from an eye witness. The first sight of such a case is very worrying, but more often than not when the case is looked into, it is not so bad as at first appeared. All cases, however, do not recover, which ones will do so it is impossible to say at this stage, and thus the importance of a rigid, careful routine examination is clear.

There is blood on the face, hair and clothes, where is it from? Look for wounds in the ear, the mouth, or on the head, face or neck. Blood may be found in the meatus of one, or, more rarely, both ears: look for a torn drum, or a

wound in the wall of the meatus. Never syringe out such an ear as you would at once wash into the wound some infection and so set up a meningitis, should there be a tear of the drum with a fracture of the bone behind. Beware of blood being washed into an ear from the outside. Epistaxis may be abundant, but the nose bleeds easily, and it is usually not of great importance; when persistent it may indicate fracture of the anterior fossa. Blood from the mouth might come from a fracture of the anterior fossa, pituitary fossa, or the middle cranial fossa, but you will be well advised to look for a bleeding point along the gums and teeth or on the tongue, before thinking of one of the former more serious causes.

Never omit to look carefully at the face, even during the period of concussion. One angle of the mouth may be seen to be drawn up, or one cheek may be sucking in and out with each respiration, indicating involvement of the facial nerve in a fracture of the petrous mass of bone.

A black eye may be caused by a local injury, when it will be of little importance, but again look carefully to distinguish between this local injury and the black eye with proptosis, due to an intra-orbital hæmorrhage following fracture of the orbital plate.

Strabismus is a sign which is apt to cause some trouble in interpretation. If there are relatives about enquire from them whether the patient suffered from the condition before the accident, otherwise you will, one day, attach a wrong interpretation to this sign. Internal strabismus points to paralysis of the external rectus muscle of the eye, and a fracture of the petrous angle with involvement of the sixth nerve. This is the commonest nerve involved in fracture of the base of the skull. External strabismus is due to an injury to the common motor nerve to the eye as it passes through the foramen in the sphenoid bone.

It will be seen that, even at this early stage, we may, by careful examination, arrive at a fairly accurate diagnosis.

We have not mentioned the temperature, pulse, and respiration rate. These data, of course, should be obtained, and orders given for them to be observed every half hour, and a graph made. Never simply write down the figures representing the rates; a mass of such figures conveys nothing to us after three or four hours. Make a graph, using coloured ink or pencil, one colour for each set of observations to be recorded. Then, when looked at in a few hours' time, we can at once tell what is happening, and what has happened. The urine must be examined. Note on this chart when urine is voided, when the patient vomited, etc. Thus, we have all the available data collected together.

After twelve, eighteen or twenty-four hours, the signs will be all the more marked. Bleeding will have stopped and you may now find cerebro-spinal fluid trickling from one ear. It will not usually be possible to say whether or not there

is cerebro-spinal fluid coming from the nose or mouth on account of the presence of the normal secretions.

By now ecchymoses will have commenced to appear. Evert one or other of the lower eyelids, and you will perhaps see a red blotch. This is an infiltration of the subcutaneous tissues of the lower lid with blood which has gravitated down from a basilar hæmorrhage.

Just below the tip of the mastoid process, there may be present a bruising, which, if present, is of the greatest help. It clearly indicates a severe contusion, or fracture through the base of the skull. I have seen this sign present without any other.

Examine the nape of the neck for the presence of a large, diffuse, and perhaps increasing swelling, which will come from a fracture of the posterior fossa.

The vault of the skull may show any one of a variety of fractures. Examine this region carefully; a hæmatoma overlying a fracture is particularly deceptive.

At this stage, you may meet with certain phenomena which are very disquieting. The concussion is noticed to have deepened and to have passed into a true coma. The pulse is feeble, the respirations interrupted and there is marked cooling of the face, hands and feet—signs of impending death.

Another case may show a pulse of 40 to 50, respirations stertorous, one pupil larger than the other, face and head persistently turned to one side, so that when they are turned to the opposite side, they turn back to their original position. There may be localized or generalized convulsions, both tonic and clonic. These are all reactions indicating a particularly severe lesion and a bad prognosis. They are due to cerebral compression by blood or bone fragments, basal or ventricular hæmorrhage, or cerebral contusion.

The normal picture of concussion passes off more or less quickly, and generally within twenty-four hours of its onset. Sensibility, movements and consciousness return in that order. Concussion having gone, the local signs are displayed, hemiplegia, motor or sensory mixed; regional paralyses, etc., can all be seen now.

Even if there are no such signs, the concussion must disappear completely in order to dispel all fears for the patient. Persistence of any sign or symptom spells danger. After an interval in such a case, coma may set in. The classical lucid interval has passed and the stage of compression has established itself. This coma is accompanied by paralysis, unequal pupils, stertorous breathing, and a slowing pulse rate with a high blood pressure. Early examination of the fundus of the eye, even during the lucid interval, might have given some indication of the impending disaster, by the presence of papillary stasis.

The onset of this coma usually indicates interference with the intra-cranial circulation, the mechanism of which we have already discussed. The hæmatoma may be extra-dural, sub-dural, or both. From the point of view of opening the skull later on, it is of importance to remember that, although usually the bleeding is from the middle meningeal artery or one of its branches, it may come from the pial or from the intra-cerebral veins. The main hæmatoma always affects one part of the brain more than the rest, and consequently gives rise to symptoms which vary with its situation. In the early stages, the symptoms will be those of irritation, due to the venous stasis; later, they are paralytic, due to the anæmia of the part caused by capillary compression. As the compression sets in, it is preceded by a wave of irritative signs, due to the venous stasis. Later, as the anæmia takes the place of the venous stasis, the paralytic signs become evident in a succeeding wave, so that you will see in one and the same patient both types of sign. The table before you gives you the main localizing signs, together with those of concussion and compression.

	Irritative	Paralytic
Hemispheres ..	Irritability, stupor, restlessness.	Coma.
Motor cortex ..	Jacksonian fits.	Hemiplegia, hemiparesis.
Mid-brain ..	Contracted pupil.	Dilated and fixed pupil.
Medulla ..	Vomiting.	
(a) Respiratory centre.	Slow stertorous breathing.	Shallow irregular breathing.
(b) Cardiac ..	Slow pulse.	Rapid weak pulse.
(c) Vasomotor	Raised blood pressure.	Falling blood pressure.
	Concussion	Compression
General condition	Unconscious, slowly regains consciousness.	In a classical case: concussion, lucid interval, increasing drowsiness and coma.
Appearance ..	Pale; respiration shallow.	Flushed; respiration becomes stertorous.
Pulse ..	Increased in rate and feeble.	Slow and bounding. Rapid and feeble when cardiac centre fails.
Temperature ..	Subnormal.	Unequal on the two sides.
Musculature ..	Relaxed; reflexes diminished or absent.	Varies on the two sides.
Sphincters ..	May be incontinent.	Become incontinent.
Pupils ..	Moderately dilated; equal in size, react sluggishly to light.	On side of injury: pupil contracts, and later dilates. The opposite side follows.

Let us now pass on to cerebral contusion. This may be of a major or a minor type.

The patient, having recovered from his concussion, passes almost imperceptibly into a state of stupor. He lies curled up in bed, and at times may be difficult to rouse. At other times, he is noisy, resentful of interference, disoriented, restless and irritable. He may even become really violent and have to be restrained. After an interval, he may become rational again, only to relapse into the stuporous condition once more, after a longer or shorter period. During the time he is mentally clear, he has complete amnesia for the previous period of stupor. Lumbar puncture will reveal fluid under pressure, and perhaps blood. This condition of alternating lucidity and clouded consciousness may persist for weeks. The patient must be watched with the greatest care, and not allowed out of the care of a competent doctor, no matter how the relatives, or the patient himself, in his lucid intervals, may press for permission to leave the hospital.

Minor contusion should be suspected when there is violent headache, giddiness, insomnia, and mental disability. The condition may arise after an injury with or without concussion, or follow as a sequel on major contusion. The headache is very markedly affected by posture, being increased by physical exertion, mental stress, and curiously enough by lying down. The giddiness is similarly affected.

In either form, there may be a raised temperature, without other signs to account for it.

You must always bear in mind that there are late sequelæ to head injuries which are very grave, such as meningitis, cerebral abscess, and chronic sub-dural hæmatoma.

The treatment of head injuries can be divided into two important steps, early observation and collection of data concerning the case. If there is a compound fracture and a wound present, it must be excised at once. If this is done by the surgeon in direct charge of the case, then he will decide what he will do. But if you are faced with a case with a wound present, it is your duty to excise that wound at once with all the aseptic precautions possible. Do not first rub the surface with gauze soaked in antiseptic. You will do no good, but only push any infection that may be present deeper into the tissues. Gently dab the edges of the wound with tincture of iodine or alcoholic picric acid solution; take a sharp knife and cut away the edge of the wound, making sure that you are cutting through healthy tissue only. Apply a firm dressing (dry) when you are sure that there remains no damaged tissue or debris in the wound. If the hæmorrhage worries you, apply a bandage, twisted and plaited, around the head at the level of the brow. Into the knot put a pair of forceps and turn them until the required degree of tightness is obtained. This tourniquet may be left in place for at least twenty minutes if there has been severe bleeding. Do not make any



attempt to sew up the wound. More harm has been done by ill-advised attempts to close wounds, which, if they had been left open, would not have given any trouble. Time and time again have I seen doctors so keen to sew up a wound, that they do not even take the time to carry out the ordinary and elementary step of cleansing their own hands! Cleaning the wound never entered their heads. You can only expect disasters if you do not carry out the elementary rules of surgical cleanliness.

The next step in the treatment, after limitation of, or elimination of, sepsis, is one which directly concerns the surgeon, relief of intra-cranial pressure.

In a case of simple concussion, recovery will invariably be complete in twenty-four hours. It is necessary to warn the patient, and his friends, that a period of at least three weeks' complete rest is essential, and that a very gradual return to normal life is equally essential, if subsequent headaches are to be avoided. I have seen the headache, occurring three months after discharge from hospital, so severe that it was necessary to perform a decompression to obtain any relief. If the return to normal life be gradual, then there is little or no possibility of the occurrence of such complications. Direct surgical treatment is only called for during the first twenty-four hours, by the onset of coma and paralysis after a lucid interval.

In the presence of compression the only treatment is operation, and to be successful it should be performed in anticipation, *i.e.*, before the major signs of compression are present. Careful observation is necessary to localize the symptoms, for only in those cases where localization has been possible can there be any hope of a complete recovery. Other cases may recover but will more than likely be left with some symptom or other to bear witness that their treatment has been empirical. It is in this matter of observation that you are of the utmost importance. You may be the only doctor to see the case for some hours, and upon your observations the surgeon will depend largely for the early history of the case. Therefore, concentrate upon setting down in writing all you see without making any attempt to interpret what you see, at once. The interpretation will become obvious later, when you have collected sufficient data. Keep the pulse and respiration chart with care. Note the type of respiration, and so on. But always make your notes in writing—do not leave it to your memory.

The operation of craniotomy not only allows the removal of the hæmatoma, and ligation of the bleeding point, but also offers an exit for further oozing, and relieves the tension in the brain substance caused by the œdema and the contusion. Arterial hæmorrhage may be diagnosed in a patient who, after complete or partial recovery from the stage of concussion, sinks into coma or shows paralytic signs. If the site of bleeding can be localized, then operation may be undertaken with some confidence. If,

however, this has not been possible for one reason or another, then sub-temporal decompression is the operation of choice, and is a life-saving measure. In cases of gross injury with evidence of bulbar involvement, sub-tentorial decompression should be performed.

The treatment of major and minor contusion consists in rest in bed in a sitting position, and relief of the intra-cranial disturbances.

The intra-cranial disturbances have their origin in the increased intra-cranial and cerebral tension. In slight cases, this tension may be reduced by giving full doses of magnesium sulphate by mouth, daily. In severe cases, the choice lies between this and intravenous hypertonic saline, with the weight of evidence in favour of the magnesium sulphate in large doses by mouth and per rectum as the better treatment. The dose per rectum is three ounces of magnesium sulphate in six ounces of water, run into the rectum very slowly and retained as long as possible. This, plus the doses by mouth, will cause a copious evacuation of fluid per anum, so relieving the body of a fair amount of its fluid content. During this treatment, only enough water will be allowed, to keep the mouth from becoming dry, otherwise you will defeat your own ends. A rapid release of pressure may be effected by lumbar puncture. This must be done with the greatest care, with the patient in the lateral position, and never sitting up. I have seen lumbar puncture performed on a case, where the intra-cranial pressure was raised, with the patient in the sitting position. The fluid was allowed to flow freely from the needle, and of a sudden the patient collapsed, gasped once or twice and died. The medulla had been forced down into the foramen magnum by the sudden release of pressure, causing immediate death of the unfortunate patient.

Where there are persistent symptoms such as delirium, sub-temporal decompression allows a rapid resolution of the cerebral œdema and a means of removing the surface clot or of arresting the hæmorrhage.

In conclusion, a word with regard to convalescence, a matter of the greatest importance in the treatment of head injuries and one too often lost sight of with the recovery of the patient from the immediate effects of the injury.

The whole scheme varies greatly with the type of patient, his social standing, his education and financial means, and last but not least with the mentality of his closer relatives. In general, however, some plan along the lines indicated below should be adopted:—

For the first four to ten days nurse the patient in a darkened room, in bed. Read to him for short periods, but he should not be allowed to read himself. Only one visitor per day should be permitted, and it must be seen to that the person allowed in is a sensible relative or friend, of some influence with the patient.

If there is good progress under this regime, the next step is to have the patient out of bed



in an easy chair for gradually increasing periods each day. The room may be better lighted now but not open to the direct sunlight. Listening to the gramophone or wireless, looking at the pictures of some illustrated paper, or doing a jigsaw puzzle are suitable amusements for this stage.

Along these lines of gradual convalescence, the patient should be quietly led back to a normal life. Some will recover rapidly, others more slowly; the speed of convalescence must be carefully gauged by the medical attendant.

Return to work should in no circumstances be allowed before at least four to five weeks have

elapsed from the time of return to complete consciousness. When work is resumed, arrangements should be made for the patient to be able to continue this gradual return to normal.

Very frequently, bromides will be found useful and in many cases essential for long periods, in some cases up to a year or more.

Finally, the patient's reactions to treatment are the sole guides to what should and what should not be done in any given case. Only by an assiduous study of the individual and his particular natural history can the practitioner hope to attain success in the treatment of that patient.

## Medical News

### THE INDIAN POPULATION AND FAMILY HYGIENE CONFERENCE

It is proposed to hold the Second Indian Population Conference and the First Family Hygiene Conference at Bombay in the second week of January (about the 12th) 1938. There will be a combined public session after which the conference will dissolve into the following sections:

<i>Population</i>	<i>Family hygiene</i>
(1) Economics	(1) Maternity and child welfare.
(2) Sociology and anthropology.	(2) Birth control and sterilization.
(3) Nutrition	(3) Medical problems including sterility, abortion and venereal diseases.
(4) Vital statistics	(4) Problems of sex, including sex education and sexual perversion.
	(5) Housing and health.

The papers to be read at the conference and the presidential addresses, general and sectional, will be printed and made available to the delegates and members at the opening of the conference. The names of the general and sectional presidents will be communicated in due course.

Papers to be read at the conference should be submitted *not later than the 1st November, 1937.*

### LIST OF OFFICERS OF THE WOMEN'S MEDICAL SERVICE FOR INDIA WHO RECEIVED THE CORONATION MEDAL

1. Dr. H. M. Franklin.
2. Dr. M. C. Murphy.
3. Dr. E. Hamilton-Browne.
4. Dr. H. M. Lazarus.
5. Dr. Grace Stapleton.
6. Dr. L. deMenezes.
7. Dr. Ruth-Young.
8. Dr. G. Patel.
9. Dr. N. Mucadam.
10. Dr. Torrance-Allen.
11. Dr. L. Ghosh.
12. Dr. Roulston Mitton.
13. Dr. K. McDermott.
14. Dr. H. Keane.
15. Dr. A. Dodhi.
16. Dr. H. Acheson.
17. Dr. D. Bolton.
18. Dr. E. Wingate.
19. Dr. U. Morton.
20. Dr. I. Keess.

21. Dr. N. Proctor-Sims.
22. Dr. J. Orkney.
23. Dr. C. L. Houlton.

### MEDICAL COUNCIL OF INDIA

THE General Medical Council of Great Britain have recognized for registration the medical qualifications of the Calcutta University granted on or after 16th October, 1936, the date on which the medical inspectors of the Medical Council of India completed the re-inspection of the Carmichael Medical College and Hospital, and declared that the facilities provided by the college might be considered adequate.

Consequent on the separation of Burma the Executive Committee of the General Medical Council have been advised that any application for the recognition of diplomas granted by the Rangoon University should in future form the subject of direct communication between the authorities of the University and the General Medical Council. It is understood that the General Medical Council are taking steps to invite the attention of the authorities of the Rangoon University to the appropriate procedure.

### EXTRACT FROM MORNING SESSION, WEDNESDAY, 7TH JULY, ON THE TRAINING OF NURSES OVERSEAS AND FOR OVERSEAS SERVICE

DR. MARGARET BALFOUR, speaking before delegates from all over the world at the Eighth Imperial Social Hygiene Congress held in London during the week 5th to 9th July, made some interesting observations on the nursing profession and the methods adopted for the training of nurses overseas and for overseas service.

'The nursing profession', she said, 'has, in the course of considerably less than a century, opened out as one of the most far-reaching careers open to women in the modern world. It affords scope for all kinds of character. It satisfies the desire for service, the scientific mind, skill in manual dexterity, administrative talent, and the urge for adventure and pioneering which is so strong in many women.'

'Nursing in the United Kingdom has become a fine art. It is also a strongly organized profession, legally entrenched behind its own council, with its own college, making its own laws, and requiring from its members a high standard of work and conduct which is beyond praise.'

'A number of training schools in the British Empire—in countries such as Australia, South Africa, etc.—has gained this distinction, but these schools are mainly employed in training European girls or girls of European descent, and the problems of training do not differ

much, if at all, from those in England. In this report it is not proposed to deal with these training schools, but with the others, where the training of women of the indigenous races is being carried on'.

Dr. Balfour went on to say that the suffering and loss of life caused by unskilled midwifery are everywhere recognized, and the saving of life due to maternity and child-welfare work is becoming more and more apparent. In many overseas countries there is a high maternity and infant mortality and medical relief of women and children is backward. To remedy this situation 'overseas' Dr. Balfour said that knowledge should be spread by selected individuals, men or women, belonging to the people familiar with their language and customs but trained in the science which, applied practically, would revolutionize the life and welfare of these countries.

One method adopted to ascertain data on the question of maternity and child welfare has been to send out a questionnaire to governments and organizations with which hospitals are connected, and to ask them to fill in the particulars asked for regarding the training of nurses.

Dr. Balfour said that she realized that this was not an ideal way of getting information and that personal visits and conversations would be better. She hoped, however, that the questionnaire would serve as a basis for discussion and lead to some definite suggestions for further progress.

The countries from which replies have been received include India, Ceylon, Malaya, Hongkong, Uganda, Tanganyika, Nyasaland, Nigeria, Sierra Leone, the Gold Coast, Bathurst, Protectorates of South Africa, Palestine, many West Indian Islands, mandated territories of New Zealand, and some others. The races include all the people indigenous to these countries. With such a great variety of countries and people it is not possible to go into much detail, but merely to inquire into certain factors which appear to be essential wherever the training of nurses is seriously undertaken.

Dr. Balfour mentioned a subject which has not been dealt with extensively before. This was the moral welfare of pupil nurses.

She spoke of 'moral lapses' as preventing better results, and some speak of the inadvisability of sending nurses to care for patients in private houses unless a 'chaperon' accompanies them. In countries where the position of women is backward and where their education is only beginning to progress, the mass of the people do not understand that a woman, especially if unmarried, can leave her home to take up work, without immoral intentions. If she lives alone, or even goes about alone, advances are made to her. Many of the girls have themselves been brought up to look on early marriage as their goal, and the three or four years of hospital training after they have reached adult life are a difficult time. Supervision, plenty of work, games, and efforts to implant in them other interests besides sex will be useful. The most difficult time comes after training is finished.

It frequently happens, especially in the large towns, that more nurses are trained than can find posts in hospitals or can get employment in other organized activities. These drift into private nursing, and as they are sometimes the least fitted to stand alone, it may end in prostitution. Much can be done to help such nurses by the organization of clubs and hostels and by personal influence. It should be looked on as a matter of the supreme importance, not only on account of the individual nurses, but because such a state of things is a reproach to the nursing profession and a hindrance to its usefulness overseas.

Dr. Balfour in conclusion said that it seemed to be taken for granted that nurses must be single. 'Would it not be possible to train married couples, allowing them to live in married quarters?' she asked, 'and for after-employment could it not be arranged that work should be made suitable for married women living with their husbands?'

## CENTRAL ADVISORY BOARD OF HEALTH

THE idea of a Central Advisory Health Board is no new conception. Between 1909 and 1914 three notable sanitary conferences were held in Bombay, Madras and Lucknow under the presidentship of the Hon'ble Member for Education; two bacteriological conferences were held in 1918 and 1919; and three conferences of provincial sanitary commissioners took place in 1918, 1919 and 1920. These led up to the establishment in 1921 of a Central Health Board to advise the Central Government and Provinces. Unfortunately only one meeting of this board was held before the 1923 retrenchment axe fell. Then in 1927 the late Sir Fazl-i-Hussain suggested the resuscitation of the public health board, but the proposal did not materialize owing to financial difficulties, although the majority of local governments in 1928 had decided in favour of it. The Indian Statutory Commission stressed the need of improving certain aspects of public health by a wider organization staffed by competent officials whose function would be to co-ordinate and encourage this work. A further attempt to constitute a Central Board of Health was therefore made in 1933 but again financial reasons intervened. The necessity for periodical consultation and for interchange of information between provinces and states and between them and the Central Government became more and more apparent. The Government of India Act provided for the constitution of advisory councils in different governmental fields of activity; moreover, machinery of the kind was already in existence for matters relating to agriculture, animal husbandry and education. It was therefore no great surprise when H. E. the Viceroy, in his address to the Indian Legislature in September 1936, announced his intention of establishing a Central Advisory Board of Health. Shortly afterwards the Government of India issued a resolution constituting the board and the inaugural meeting was held in Simla on 22nd and 23rd June, 1937.

The board was constituted as follows:—

- (1) The Hon'ble Member in charge of the Department of Education, Health and Lands as chairman.
- (2) Two representatives of the Government of India, *viz*, the Secretary, Education, Health and Lands Department, and the Director-General, Indian Medical Service.
- (3) Provincial Ministers in charge of Public Health.
- (4) One member elected by the Council of State.
- (5) Two members elected by the Legislative Assembly.
- (6) A representative of the Railways.
- (7) A representative of the Defence Department.
- (8) Three representatives of Indian States (Hyderabad, Mysore and Jodhpur).
- (9) The Rani of Sherkot.
- (10) The Public Health Commissioner with the Government of India as Ex-officio Member-Secretary.

That the important part which the board might be expected to play was recognized by all provincial governments, was made evident by the fact that most of the provincial ministers found it possible to attend the meeting. Where other engagements prevented their presence, the ministers were represented by the Government Secretaries of the Local Self-Government and Public Health Departments. In addition two Inspector-Generals of Civil Hospitals and most of the provincial Directors of Public Health attended as advisers to the Ministers and Secretaries.

H. E. the Viceroy honoured with his presence the opening session of the board. In requesting His Excellency to open the meeting, Sir Jagdish Prasad, the chairman, dwelt upon the serious health problems with which India was faced. He indicated how industrialization had exposed its people to new dangers owing to urban congestion and that more heed must be paid to the question of housing, water supplies, drainage and food. He also invited attention to the very high rate of infant mortality and to the generally bad sanitary conditions which impaired human efficiency in every walk of life.

Reminding the members of the board that artificial provincial and state boundaries were no barriers to the spread of disease, the chairman went on to express the belief that the Advisory Board of Health would provide a great opportunity for every one concerned to pool experience and effort in the common task of improving the health of the people of India. Sir Jagdish Prasad emphasized the fact that the presence of H. E. the Viceroy was a source of great encouragement to the board and hoped that His Excellency's inauguration of the meeting would not only give its deliberations their proper significance in the estimation of the public, but would stimulate members of the board in their efforts to bring a little more sunshine and gladness into Indian homes.

His Excellency then delivered his inaugural address which has already appeared in the press. H. E. the Viceroy not only welcomed the members of the board on his own behalf and that of the Government of India, but expressed his pleasure at being able to open the first meeting. In the course of his address His Excellency made pointed reference to a number of subjects which in his opinion demanded early consideration and expressed the emphatic opinion that, although the functions of the board were purely advisory in nature, such recommendations as might be made by the board would be of the greatest value to both provincial and state governments.

After H. E. the Viceroy had withdrawn, the board commenced its deliberations. The following items had been placed on the agenda:—

1. Procedure.
  2. Quinine supplies in India.
  3. Organization of the provincial public health departments.
  4. Nutrition surveys.
- In taking up the first item the chairman referred to the three main functions of the board. These were:—

- (1) 'To act as a central information bureau on all public health matters affecting India and as a clearing house for such information',
- (2) 'to advise on any matters referred to it by the central or by provincial governments', and
- (3) 'to make suggestions to Government on any matters affecting public health in India to which the board considers that Government's attention should be drawn'.

In regard to the first of these functions, the desirability of a wider publicity in regard to health matters was stressed by several members of the board, and the suggestion was made that such questions as infantile mortality, malaria, tuberculosis, etc., should be dealt with in short and succinct bulletins which should be widely distributed. A further suggestion was made that the information contained in the Public Health Commissioner's annual reports should be issued in separate notes or bulletins written up in popular language. The translation of these notes into the various vernaculars was, however, the function of provincial and state Directors of Public Health. The same methods, it was considered, should be adopted in the case of the reports of the Scientific Advisory Board, Indian Research Fund Association, and the papers published in the *Indian Journal of Medical Research*, *Records of the Malaria Survey of India* and other journals.

The secretary explained what had been done during the past two years in obtaining information in regard to the incidence of epidemic and other diseases from Indian States. He also outlined the methods which have been adopted for exchanging that information between provinces and states and vice versa, and hoped that this system would be further developed.

The note in the memorandum on the functions of the board as a Central Information Bureau was generally approved, and it was decided that the methods outlined there should be followed and developed.

As regards the board's function as an advisory body to the central and provincial governments, it was agreed that every subject referred to the board should

be accompanied by an explanatory memorandum. Each memorandum with a note from the secretary should be circulated to the members of the board, so that they might have the opportunity of making such comments as they desire. The chairman stressed the necessity for leaving a considerable latitude to him and the secretary in preparing the agenda for further meetings.

In regard to the third function of the board, it was decided that any member should be at liberty to forward to the secretary proposals and suggestions with an explanatory memorandum in each case.

The board agreed to the formation of *ad hoc* committees and decided that each should ordinarily consist of not more than five members, although these members will have power to co-opt such other persons as they thought necessary.

The number and size of *ad hoc* committees and the frequency of meetings, it was decided, should be restricted as far as was compatible with their duties.

At a later stage of the proceedings two *ad hoc* committees were appointed to report on:—

(a) Maternity and child-welfare work in India, including the training of maternity and child-welfare workers and the organization of maternity and child-welfare schemes for urban and rural areas; and (b) food adulteration and the methods and standards in force for its control in different parts of India.

The membership of these *ad hoc* committees was left over for further consideration. The reports of these committees would in due course be laid before the board, and, if accepted, would then be sent for consideration to all local governments and state governments along with the board's recommendations.

It was decided that the board should hold its annual meetings in November or December in Delhi each year.

As regards the question of quinine supplies for India, it was generally recognized that the problem was one of the most difficult of the many in the field of preventive medicine in this country. The memorandum on the subject which had been circulated to members before the meeting indicated some of these difficulties and members generally were in agreement with the views expressed therein. To the question whether India should attempt to extend cinchona cultivation in order to satisfy its quinine requirements the reply of members was in the affirmative and the board was unanimous in supporting the proposal to use Rs. 1 lakh which had been set aside by the Indian Research Fund Association for investigation and the possibilities of extending cultivation of cinchona. Closely associated with this question is the cost of production. It was felt that when the proposed investigation was completed it should then be possible to determine whether or not there was a possibility of reducing the price of cinchona products to a level which the ordinary villager could afford. The opinion was that if this investigation was able to indicate possibilities of reduction in the price of the drug the expenditure involved would be very much worth while. The discussions also included references to improved and cheaper methods of distribution. Various suggestions were made in regard to methods of distribution and to the popularization of quinine among the general population. Eventually the following resolutions were passed by the board:—

(1) The board considers that policy should be directed to making India self-supporting in the matter of quinine.

(2) The board welcomes the proposal of the Indian Research Fund Association to institute an inquiry by an officer experienced in cinchona cultivation, in association with a soil chemist, on (a) what further areas in India are suited to cinchona cultivation, and (b) what would be the cost of production in such areas.

(3) The board considers that the price at which quinine is sold at present in India is too high, as it is greatly in excess of the cost of production, that producing Governments in India should not regard the production of quinine as a source of profit and that even if any profit accrues from its sale such profit should be earmarked for expenditure on public health.

(4) The board while taking note of the position that the control of the production, distribution and sale of quinine is now a purely provincial function, considers that in the interests of India as a whole the question of the advisability of the resumption of such control by the Central Government should be seriously considered.

(5) The board considers that much more intensive propaganda than has hitherto been adopted is necessary to bring home to the people, especially in the rural areas, the utility of quinine as a cure against malaria and that the possibilities of its cheaper and more widespread distribution through non-official and other agencies should also be sympathetically explored. The board further considers that steps should be taken to ensure that the products of cinchona sold in India are unadulterated.

In opening the discussion on the organization of public health departments the secretary reminded the board that the memorandum which had been circulated to members dealt only with one aspect of the general campaign for the promotion of the health of the people and whilst stressing the fact that a public health department had a number of functions which were distinct and separate from those of a medical department, he also laid stress on the importance of the necessity for constant co-operation between these departments, if the best results were to be obtained. The memorandum emphasized the necessity for whole time health officers both in districts and municipalities and indicated in tabular form how very deficient most parts of India were in regard to qualified health officers. The suggestions were made that in each provincial headquarters there should be constituted a provincial health board and that in each district headquarters some form of health bureau or committee should be formed in order that close co-operation might be maintained between the public health, medical and other departments.

The importance of revising the curriculum for medical students was also stressed, in order that the young medical practitioner might be given a better idea of the preventive aspect of medicine and of the necessity for maintaining the preventive outlook in his day to day practice.

The discussion on this item on the agenda was both long and interesting and most members of the board and a considerable number of their advisers took part. The general feeling was that the time had come for a wide development of district and municipal health organizations and the resolutions which were passed on the subject are a clear indication of the acceptance of the views outlined in the memorandum. The resolutions were as follows:—

(1) The Advisory Board of Health having considered the facts set out in the memorandum dealing with the organization of public health departments recommends that all local governments should possess powers (a) to form provincial public health services, (b) to require municipalities and local boards to appoint medical officers of health, and (c) to lay down suitable conditions for the recruitment, qualifications and terms of service of health officers. The board further recommends that where local governments do not possess these powers the necessary legislation should be passed with the least possible delay.

The board is further of opinion that for the development of public health organizations and the formulation of public health schemes in municipalities and districts, adequate funds should be allotted by provincial governments and local bodies. To the same end the system of percentage grant-in-aid from provincial governments to their local bodies is one which should be encouraged.

(2) In order to promote co-ordinated effort in preventive medicine between the medical and public health departments, the board recommends the establishment of a Central Health Board (or committee) at the headquarters of each province and of a health bureau or committee in each district.

(3) The board desires to bring to the notice of all Governments, Provincial Medical Councils and the Medical Council of India the necessity for improvement

in the teaching of hygiene and public health as part of the medical colleges' and schools' curriculum for medical qualification and registration.

In regard to item (4) which dealt with nutrition surveys, the secretary in opening the discussion stated that it was now clear that diet was the most important single factor influencing general health and development. The memorandum on the subject which had been circulated to members before the meeting indicated what the Government of India and the Indian Research Fund Association had been and were doing and also made clear the importance of expanding both research and survey work in the field.

Although a number of the provinces had availed themselves of the present opportunity afforded at the Nutrition Research Laboratories, Coonoor, for the training of one of their public health officers in nutrition work, others apparently had not realized the significance of this branch of public work. It was hoped that those not represented at the present course would be able to depute one of their officers to the next course of training. The fact that so many people in India presented malnutritional conditions of different forms indicated the great importance of further research and investigation and the presence of trained men in provincial public health or medical departments would make it possible to carry out the necessary investigations and surveys.

Closely allied with the whole question of nutrition is that of food adulteration. This is another field in which officers trained in nutrition work should be able to play an important part, because in India food adulteration is known to be practised to a very great extent.

Reference was also made to the necessity for spread of knowledge in regard to food and nutrition. The health bulletin recently prepared by Dr. Aykroyd was used as an illustration of the methods to be employed in this connection and here it may be added that the first edition of Dr. Aykroyd's bulletin, numbering 10,000 copies, has already been sold out and that demands for it are being received in such large numbers that the bulletin is likely to be a best-seller for months to come.

Several members of the board took part in the discussion and expressed general approval of this line of work and of the methods which had been employed. Considerable anxiety was also shown in regard to the health conditions revealed by the investigations mentioned in the memorandum and the four resolutions which are passed by the board give expression to that anxiety. The resolutions read as follows:—

(1) The board recommends to all local governments the desirability of training at Coonoor a number of their medical and health officers in nutrition work so that they may be able to advise on the problems associated with malnutrition and deficiency disease.

(2) The board recommends to local governments the desirability of conducting dietary surveys in each province and of instructing their medical, public health, agricultural and other departments to co-operate in every possible way with the workers carrying out these surveys.

(3) The board recommends to local governments the necessity for providing funds for the dissemination of suitable propaganda material in regard to foods, etc., based on Health Bulletin No. 23, 'The nutritive value of Indian foods and the planning of satisfactory diets' and on such additional material as may be made available by the Director, Nutritional Research, and by others.

(4) The board is of opinion that the Government of India's expenditure on nutrition research is inadequate and should be increased.

The valuable suggestion was made by Colonel Norman Walker that the Central Advisory Board of Health should act in its capacity as a clearing house for type designs, model by-laws, etc., used in different provinces and states. The board agreed that its Central Information Bureau should make arrangements to obtain from provinces and states public health type designs now in use with any explanatory memoranda which might be

available. The bureau should also make similar arrangements to obtain copies of all by-laws in force which deal with public health subjects, such as buildings, markets, slaughter houses, water supplies, etc., etc. Copies of all such material should then be sent to all public health departments in provinces and states so that each would be aware of what was being done in other parts of India.

The board also decided to appoint a committee to examine and report on joint civil and railway and cantonment health problems, especially in relation to the control of malaria.

During the two days the meeting lasted, it was made evident that the board was likely to fulfil the hopes expressed by His Excellency in his opening address.

The general discussions were both useful and illuminating and when the concluding remarks were being made by individual members and the chairman a feeling of satisfaction was generally made apparent. The vote of thanks to the chairman included the expression of the members' indebtedness to him for his keen interest and sympathetic attitude.

### INDIAN MEDICAL COUNCIL

LIEUTENANT-COLONEL F. A. BARKER, O.B.E., Officiating Inspector-General of Civil Hospitals, Punjab, is nominated as a member of the Medical Council of India from the Province of the Punjab.

## Current Topics

### Lumbar Puncture in General Practice

By W. G. WYLLE, M.D., F.R.C.P.

(From the *Practitioner*, Vol. CXXXVII,

December 1936, p. 906)

TO-DAY, both as a diagnostic and as a therapeutic measure, lumbar puncture is often essential. Yet, this minor surgical procedure of tapping the spinal subarachnoid space has only been in general use for about forty years. Steps leading up to its introduction were, first, the experimental injection of fluids through the theca in the dorsal region by Corning (1885), followed by the draining of fluid at the lumbar level in cases of tuberculous meningitis by Essex Wynter using a Southey's tube, and later Quincke's elaboration of a technique practically identical with that employed to-day.

The lumbar level is chosen for puncture by reason of the fact that the lower end of the cord, or conus terminalis, in the adult terminates at about the upper part of the body of the second lumbar vertebra. No damage, therefore, to the cord can occur when puncture is performed through the third or fourth lumbar interspaces. In an attitude of flexion with the trunk bent well forwards, the tail end of the cord rises slightly within the spinal canal. This fact is specially important in dealing with infants, as at birth the cord terminates behind the body of the third lumbar vertebra.

With a little skill and a due amount of care the technique of lumbar puncture can readily be acquired. The occasions for its use as a valuable and often essential diagnostic aid in general practice are frequently recurring.

#### INSTRUMENTS AND METHODS

##### Essentials:—

- (1) Two lumbar puncture needles.
- (2) Two or three sterile glass test-tubes, best fitted with sterilized rubber corks, and kept in separate wooden containers for ease and safety in transport.
- (3) A small bottle of iodine, and another of collodion.
- (4) A packet of sterile cotton-wool.
- (5) A compact portable spirit-sterilizer, to boil the needles before and after use.
- (6) A 1 c.cm. glass hypodermic syringe with fine dental needle, and a small bottle of 2 per cent novocaine.
- (7) A simple manometer, for pressure estimations.

Needles should always be chosen with care. A fine lumbar puncture needle (bore no. 17 standard wire gauge) is preferable to a thicker one (no. 19 or over), as it is less likely to cause pain. It is a common error to imagine that a thick, wide-bore needle will tap fluid more easily. Except when a fluid is very purulent

or highly albuminous and readily coagulable, it will flow just as readily through a fine as through a thicker needle. Needles made of stainless steel, or chromium-plated, are commonly used, while those of nickel, or, more expensive, platinum-iridium, have the advantage of greater flexibility and a more remote chance of breaking.

The point of the needle should be sharp with short, not long, cutting edges. If, in use, the needle strikes bone the point often becomes slightly bent in which case it must be reset by the instrument maker, as attempts at lumbar puncture with such a needle will give rise to unnecessary pain and failure to obtain fluid. A good needle has also an accurately fitting stylet which can readily be withdrawn, and the sides on which the points of needle and stylet are bevelled are indicated at the handle-ends by a pin attached to the side of the stylet-head which fits into a hole or groove on that side of the needle-head corresponding to the bevelling at the point. The sharp edges of the needle's point should be directed up and down the spinal axis and not transversely, as the long up and down fibres of the ligamentum flavum and of the dura mater are more easily pierced and not torn in this manner.

*Technique.*—Lumbar puncture except for the prick of the needle entering the skin should be a painless operation. Should the point of the needle, however, accidentally come in contact with bone, great pain is caused, as the periosteum is highly sensitive. A nervous apprehensive patient, by jerking or arching the spine, can easily upset the operator's judgment of anatomical landmarks, and through muscular spasm can exert a powerful grip upon the needle, hindering its passage. To reduce pain to a minimum it is best in the adult to anaesthetize the skin at the chosen point of puncture with a small intradermal injection of 2 per cent novocaine, using a 1 c.cm. syringe with a fine dental needle. In children a light general anaesthetic, usually ethyl chloride, is preferable, which of course demands the co-operation of another qualified person. In many instances, however, the dulling of the senses incidental to the illness obviates the necessity of an anaesthetic.

A major point in the successful performance of lumbar puncture is getting the patient into the correct position. This is one in which the patient lies on his side, usually the left, close to the edge of the bed with the knees well drawn up and the head bent forwards, so that the forehead approximates to the knees. The most salient part of the spine in relation to the edge of the bed is the lumbar region. With the head, shoulders and hips in proper alignment lateral bending of the spine is prevented. A pillow should be placed under the side of the patient's head, the underlying arm is kept well forward, and with both hands clasped under the knees a greater degree of flexion of the spine can voluntarily be obtained. When obesity or breathlessness prohibit marked flexion, the posture assumed must



imitate as closely as possible that just described. With young children the correct position needs to be maintained with the aid of a nurse or assistant placing one hand on the patient's head and one beneath the knees to draw the head and knees together. A little time and care spent in getting the patient into the correct position prevent many a painful and ignominious failure in obtaining cerebro-spinal fluid.

Next, the operator by taking a line joining the highest points of the iliac crests notes the point at which this line crosses the spine, which is usually just below the tip of the spinous process of third lumbar vertebra. The needle should enter through this interspace or the one below it. After careful cleansing of the skin locally and dabbing it with iodine, the operator presses firmly with the point of the forefinger of the left hand applied to the lower edge of the third lumbar spinous process (or of the fourth as the case may be), and with the right hand passes the point of the needle through the skin just below the tip of the left forefinger. As pain of puncture in accurate alignment just below the third vertebral spine, the thumb and middle-finger of the left hand can be employed to aid the forefinger in keeping the skin from sliding sideways over the bony processes. The point of the needle is directed slightly upwards, at an angle roughly of 75 degrees, and the plane of the needle must be perpendicular to vertebrae, with point of puncture, cervical and dorsal spine and coccyx, all in a straight line. The needle is gently pushed on and at a depth of half an inch in the infant to a depth of four inches in the adult fluid should escape on withdrawing the stylet. Quite often at these depths of puncture a slight extra resistance can be appreciated as the point of the needle pierces the membranes. A twist or turn of the needle in some reluctant cases may be all that is needed to start the flow. To push steadily onwards is always unwise, as fluid obtained, if any, is usually heavily contaminated with blood from puncture of the veins lying on the posterior surface of the vertebral bodies. Rather, also withdraw the needle, and again guide it forwards in careful relationship to the various points of correct alignment. It is better to try again at a lower interspace than to make repeated attempts in the same one, as the muscle trauma will probably cause blood to appear in the fluid, and if the dura has been lacerated in several contiguous places post-puncture leakage is liable to occur producing severe headache. On withdrawing the needle the point of puncture in the skin is sealed by a small wisp of cotton-wool soaked in collodion. After and before use a needle should always be boiled, as attempts at sterilization with spirit after puncture perhaps of a purulent meningitis are unreliable.

#### CAUSES OF FAILURE

The commonest causes of failure in lumbar puncture are want of attention in getting the patient into the correct position, and faults in the needle (bending due to striking bone). With a bent needle, that portion outside the skin may appear to be perpendicular and in proper alignment with coccyx, cervical spine and occiput, and internally the point may be deviated so as to strike the meninges at a tangent. A genuine 'dry puncture' is a rare occurrence and possibly accounted for by a high degree of purulence, or by an excessive coagulability due to high protein content. In accidental contamination with blood the fluid run in small quantities into two or three test tubes becomes gradually clearer, while in a 'blood-stained fluid' the blood is intimately mixed, giving a red colour throughout or a yellowish colour (xanthochromia) even after centrifuging when the date of the hæmorrhage has been less recent.

#### THE MANOMETER

An estimate of the fluid pressure may be of importance in a suspected case of meningitis or of encephalomyelitis, and more so in cases of spinal and cerebral neoplasm and traumatism. Ordinarily the

pressure is roughly gauged by noting whether the fluid escapes forcibly in a jet or drop by drop. An easy and more accurate method is to use a needle with a two-way stop-cock, to one opening of which has been attached a piece of rubber tubing, which once the needle is in position can easily be connected with a length of glass tubing of a bore not greater than 2 mm. and not less than 1 mm. (Ayer), and graduated in fractions of a centimetre. The length of the glass tube is about 300 mm., or two pieces of 150 mm. each can be joined end to end with rubber tubing. Roughly, normal pressure readings for adults and children lie between 100 and 200 mm., while those approaching 300 mm. and over are definitely abnormal.

*Quantity of C.S.F. to withdraw.*—For ordinary diagnostic purposes in meningitis, poliomyelitis and other infective conditions 8 to 10 c.cm. are necessary for a full pathological examination. If in addition the Wassermann reaction of the fluid is to be tested a further 1 to 2 c.cm. should be allowed. When cerebral tumour, however, is suspected, only 2 c.cm. should be withdrawn, and the lumbar puncture so manipulated by means of the stylet that the fluid escapes slowly drop by drop. A manometric estimation can also be taken with the loss of very little fluid. In spinal-block, and upper spinal theca may be shut off from that at the lumbar level. An indication of partial or complete block can be obtained by performing Queckenstedt's test. Thus during lumbar puncture light pressure at the sides of the neck over the jugular veins will cause normally the fluid to escape under greater pressure. A negative test implies obstruction at some point in the spinal subarachnoid space.

#### CLINICAL USE OF LUMBAR PUNCTURE

In general practice conditions for the diagnosis of which lumbar puncture is most urgently demanded are all forms of meningitis, meningeal involvement from mastoid or middle-ear disease, poliomyelitis and various forms of 'benign lymphocytic meningitis' and encephalomyelitis which symptomatically may resemble tuberculous meningitis closely and often can be diagnosed only by examination of the cerebro-spinal fluid. In head injuries the presence of meningeal bleeding can be ascertained and a manometric measurement of pressure will decide rationally for or against employing hypertonic solutions by the bowel or intravenously to reduce intracranial pressure. Traumatic coma can exist with a diminished as well as with a heightened intracranial pressure. Less urgent but equally important is the Wassermann reaction of the cerebro-spinal fluid for the recognition and treatment of neuro-syphilis. Therapeutically, it is in meningococcal meningitis that the earlier the diagnosis by lumbar puncture, the greater are the chances of recovery employing antimeningococcal serum intrathecally.

*After-effects of lumbar puncture.*—Headache is the most frequent complaint, though much less common in children than in adults. Measures to prevent headache are to give a long warm drink of milk, tea or coffee after the puncture, and for the patient to lie in bed for eight to twelve hours. Aspirin, caffeine and phenacetin tablets help to relieve mild headache, but with more severe and obdurate pains in the adult pituitrin,  $\frac{1}{2}$  to 1 c.cm. twice a day for one or two days, can be recommended.



## The Problem of the Enlarged Heart in General Practice

By R. G. ANDERSON, M.D., M.R.C.P.

(Abstracted from the *Medical Press and Circular*, Vol. CXCIII, 30th December, 1936, p. 571)

In the examination of a heart the estimation of its size is a point of considerable importance. The efficient action of the heart depends on the state of the myocardium and abnormal enlargement of the heart is a definite indication of organic myocardial disease.

Normally the visible cardiac impulse is situated inside the mid-clavicular line, and is not larger than the size of a penny. A more diffuse cardiac impulse may be due to dilatation of the heart or to hypertrophy of the right ventricle, but it may also occur in association with fibrosis or collapse of the left lung, or pericardial effusion. On the other hand, it may merely indicate an overacting heart. It is not uncommon in nervous patients to see diffuse pulsation outside the nipple line yet to find the apex beat in its normal position. Pulsation in the epigastrium may indicate enlargement of the right ventricle, but may also occur in normal subjects.

The position of the apex beat is important. Dilatation of the heart displaces the apex beat outwards and hypertrophy displaces it downwards. It is defined as the point furthest outwards and downwards at which the direct impulse of the heart can be distinctly felt.

The distance of the apex beat from the mid-line of the chest should be measured. It is usually 3 inches to 4 inches, but varies, of course, with the size of the chest. Its relation to the mid-clavicular line is more informative. It should be situated just internal to this line. Displacement of the heart will also cause displacement of the apex beat, but error will be avoided by percussion of the area of cardiac dullness. In examining children in the standing position, the apex beat is frequently found in the fourth intercostal space outside the nipple line. If the child lies down the apex beat returns to its normal position. In these cases x-rays show no enlargement of the heart. It may be impossible to feel the cardiac impulse on account of emphysema or a fat chest wall. If these can be excluded, and if the heart is definitely enlarged, a weak cardiac impulse indicates dilatation, whilst a forcible or heaving impulse indicates hypertrophy. In the latter case it may be possible to decide which ventricle is principally involved since hypertrophy of the left ventricle gives a maximum impulse at and just internal to the apex beat, whereas hypertrophy of the right ventricle produces a heaving impulse behind the lower sternum.

Percussion of the left border of the heart usually confirms the position of the apex-beat found by palpation. It is of no value in the presence of emphysema. Dullness to the right of the sternum indicates that there is already considerable enlargement of the right auricle.

Radiology provides the most accurate method of estimating the size of the heart during life. With emphysema or a thick chest wall it may be the only method.

Enlargement of the heart may be due to hypertrophy or to dilatation, or, as is usually the case in chronic heart disease, to the two conditions combined. Hypertrophy alone gives rise to no symptoms but dilatation to any appreciable degree is always accompanied by evidence of congestive heart failure, e.g., dyspnoea, cyanosis, fullness of the veins in the neck, rales at the bases of the lungs, enlargement of the liver, œdema of the legs, or albuminuria.

Hypertrophy of the heart results from a demand for increased work. The sequence of events is as follows: obstruction to the outflow of blood from the ventricle leads to dilatation. The muscle fibres are stretched and become capable of increased work, thus tending to overcome the obstacle. If the demand for increased work persists, the ventricle undergoes hypertrophy. The three principal causes of great hypertrophy of the

heart are hypertension, aortic valve disease and adherent pericardium.

Of valvular disease, that affecting the aortic valve causes most hypertrophy. Aortic stenosis produces pure hypertrophy of the left ventricle and aortic regurgitation produces dilatation in addition. Mitral regurgitation leads to some hypertrophy and dilatation of the left ventricle, whereas in pure mitral stenosis that chamber is typically normal in size or even smaller than normal. The left auricle, however, becomes considerably dilated. In the more severe cases it extends to the right behind the great vessels, pushing the œsophagus to one side, but seldom giving rise to dysphagia. Very rarely, what may be described as an aneurysmal dilatation of the auricle occurs. In both mitral stenosis and mitral regurgitation, but especially in the former, the right ventricle hypertrophies to overcome the increased pressure in the pulmonary circulation, so that there is a heaving impulse behind the lower sternum. Because the right border of the heart is relatively fixed by the venae cavae, this enlargement of the right ventricle results in the apex beat being pushed over to the left. Later, the right auricle may dilate with a corresponding outward displacement of the right margin of the area of cardiac dullness.

It must be pointed out here that it is often difficult clinically to distinguish between hypertrophy of the right and left ventricles. As a matter of fact in chronic heart disease one ventricle is seldom hypertrophied alone.

The only two causes of mitral valve disease are rheumatism and infective endocarditis, though relative incompetence may result from dilatation of the left side of the heart. The aortic valve may be affected by rheumatism, syphilis, œtheroma or infective endocarditis. Syphilis never leads to aortic stenosis. Aneurysm of the aorta does not cause enlargement of the left ventricle unless the aortic valve is incompetent.

Congenital valve disease and abnormalities of the septa usually cause enlargement of the right ventricle. There is usually a loud musical systolic murmur, and frequently a systolic thrill. Other evidences of congenital heart disease, such as cyanosis and clubbing of the fingers, may be found if there is mixing of venous and arterial blood.

Adherent pericardium tends to be associated with the largest hearts. Adhesions between the parietal and visceral pericardium may be present without any cardiac enlargement, but if, in addition, there are adhesions between the parietal pericardium and surrounding structures, such as chest wall and diaphragm, then the action of the heart is embarrassed and all its chambers become hypertrophied. The two most reliable signs which may help in the diagnosis are fixation of the apex beat and systolic recession of the left chest wall along the line of attachment of the diaphragm.

Lung diseases obstructing the pulmonary circulation, such as emphysema and fibrosis, cause hypertrophy and, later, dilatation of the right ventricle. A cause of hypertrophy of the left ventricle which may be overlooked, unless one has it in mind, is coarctation of the aorta.

In thyrotoxicosis cardiac hypertrophy is frequently diagnosed clinically. The clinical appearance of cardiac enlargement in these cases is deceptive, and that it is due simply to the tumultuous action of the heart.

Cardiac dilatation occurs when the heart cannot expel the blood as rapidly as it receives it. It is always due to inefficient beating except in those cases in which valvular disease or hypertension has developed so rapidly that the muscle has not had time to undergo hypertrophy.

Excessive physical strain may cause transient dilatation of the heart even when that organ is perfectly healthy. This is more liable to occur in people who are untrained. The heart returns to its normal size after a few hours or days. If any healthy person runs for a sufficient length of time he will develop breathlessness, giddiness, precordial pain, nausea and perhaps faintness. These symptoms occur in some people with normal hearts as a result of very slight exertion such

as would not inconvenience a healthy person. It is to this condition that the term 'effort syndrome' is applied. It occurs as a rule in young adults of sedentary habits when they attempt to lead strenuous lives without previous training.

If the heart beats very rapidly, it beats inefficiently and becomes dilated. This is seen to occur during a prolonged attack of paroxysmal tachycardia and in auricular flutter and fibrillation. The commonest clinical condition causing acute cardiac dilatation is the onset of auricular fibrillation. Here there is a second factor leading to inefficiency. This is the presence of some heart beats which are not strong enough to produce a pulse-wave in the radial artery, so that there is a pulse deficit. These weak beats do not empty the heart completely.

The other important cause of cardiac dilatation is weakness of the muscle. This may be due to bacterial poisoning, e.g., in rheumatism, diphtheria, influenza or pneumonia, or it may be the result of malnutrition such as occurs in anaemia and in coronary artery disease.

With regard to diagnosis the position may be summed up as follows: If the heart is found to be definitely enlarged, one may be sure that there is organic myocardial disease. An attempt may then be made to assess the degree to which hypertrophy or dilatation is responsible for the enlargement, and which chamber or chambers of the heart are principally involved. With a knowledge of the possible causes of hypertrophy and dilatation, and by taking into account the history and the accompanying physical signs, one can usually determine the cause of the enlargement in a given case. It cannot be said dogmatically that the heart which is not enlarged is normal. For instance, in early mitral stenosis and in angina pectoris there may be no appreciable enlargement. In the former case error may be avoided by finding the characteristic murmur which, if not present at rest, may be brought out by examining the patient lying on his left side after exercise; in the latter by the characteristic history, which is more important than any physical signs. If a heart is normal in size, vague systolic murmurs at apex or base are of no account.

The prognosis in cardiac enlargement depends essentially on the cause of the enlargement. The state of the myocardium may be judged by the exercise tolerance test. If the patient already shows evidence of congestive heart failure, no such test is necessary. In rheumatic valve disease the exercise tolerance may be remarkably good because the coronary arteries are not affected so that the nutrition of the myocardium is not impaired. It can, therefore, undergo hypertrophy and thus counteract the mechanical defect of the valves. The degree of hypertrophy may vary enormously in two patients showing similar valve lesions and similar exercise tolerance. The prognosis is worse for the patient with the larger heart, because, little further hypertrophy being possible, failure may develop rapidly, and because the larger the heart the more liability there is for cardiac irregularities and intracardiac thrombosis to occur. Syphilis and atheroma involve the coronary arteries and give a correspondingly worse prognosis. In paroxysmal tachycardia the heart rapidly regains its former size with the return to a normal rate of beating. In auricular fibrillation, also, a considerable diminution in size may be anticipated when the irregularity is controlled by digitalis. The toxæmias seldom cause gross dilatation of the heart, and in the acute stage the prognosis depends more on the effect of the toxæmia on the peripheral circulation. Diphtheria may cause degenerative changes in the heart muscle, but the ultimate prognosis is good, as, if the patient recovers, no permanent damage ever results.

With regard to treatment, little need be said. The amount of exercise which may be allowed depends on the exercise tolerance. With slight enlargement and good exercise tolerance only the more strenuous types of exercise need be forbidden. With moderate enlargement the exercise tolerance is seldom good, and activity must be correspondingly restricted. The cause of the enlargement must be treated if possible. Digitalis

therapy is required only in the presence of congestive heart failure or auricular fibrillation.

### Calcium Requirements in Man

(From the *British Medical Journal*, Vol. I, 1937, p. 869)

It is so often suggested in nutrition surveys that calcium intakes are below the optimum that a recent review of the calcium requirements of man by Dr. I. Leitch of the Imperial Bureau of Animal Nutrition is of great interest. He calculates that the maintenance requirement of adults is 0.55 gramme daily. Sherman, whose figures have been very generally used in the past, put the equivalent figure at 0.45 gramme. Both these figures are maintenance requirements and exclude the additional health allowance which is advisable. It has been shown by Sherman in America and Orr in this country that many diets do not even reach the figure of 0.45 gramme. Leitch enters into some interesting speculations as to the possibility of senile osteoporosis being due to deficient calcium intake. In his estimates of the requirements at different age periods the most striking feature is the high requirement in adolescence, increasing up to 2 grammes between the years 15 and 16. Assuming that milk provides two-thirds of the calcium intake, this means that children at the age of 16 need two pints of milk a day.

An interesting section is devoted to the calcium supplied to the infant in breast milk. Leitch brings forward evidence that breast milk is often qualitatively and quantitatively inadequate as a source of calcium for the infant. Qualitatively in the figures he quotes from various authorities there is a range from a minimum of 0.126 to a maximum of 0.717 gramme per litre of breast milk. On the quantitative side numerous experiments are quoted which indicate that the supply of breast milk is often inadequate. More important is the suggestion that there may be a disparity between infant value and calcium content of breast milk. If this is true, then growth may be occurring in the infant without the calcium needs being properly met. Taking the optimum growth curves for infants, Leitch calculates that in order to maintain the optimum 10 grammes of calcium per kilogramme of body weight which is found at birth the calcium intake must be 0.2 gramme at one month and 0.52 gramme at six months. This corresponds in breast milk of average calcium content (0.32 gramme per litre) to a daily intake of 30½ fluid ounces at one month and 57 fluid ounces at six months. There are many nursing mothers who do not reach this yield, and if the calcium content is much lowered the possibility of deficiency arises. There are at least two assumptions in this reasoning that might be challenged. The first is the assumption that it is physiological for the birth ratio of calcium to body weight to be maintained: too little is known about changes in the ratio of bone weight to body weight in the first few months of life. The second assumption on which the calculations have been made is that 60 per cent of the ingested calcium is retained by the body. We are confronted again by the paucity of knowledge of the processes of absorption from the intestine. It is obvious that the subject of the calcium intake of infants requires careful examination. The most urgent need is to know whether the calcium content of breast milk can be affected by the mother's diet. Cow's milk contains nearly four times as much calcium as breast milk, but until there is more information about the fate of the calcium in the intestine it cannot be deduced that cow's milk is a better source of calcium for the infant. The review deals with some of the points raised in this connection. Cow's milk usually has to be diluted before being given to infants, but more important is the fact that the buffering power of cow's milk is much greater than that of breast milk. Since it is likely that the absorption of calcium depends on the pH of the intestine, the ability of the infant to absorb the calcium of cow's milk will depend to a certain extent on its power to secrete gastric hydrochloric acid. Existing knowledge of the secretion of

hydrochloric acid in children points to marked variations. To a certain extent the high buffering power of cow's milk can be reduced by treating the milk with acid. Further, it seems more than likely that one of the functions of vitamin D is to lower the pH of the intestinal contents and hence increase the absorption of calcium.

Dr. Leitch's review suggests many possibilities in relation to stature and its dependence on diet. Certainly all nutrition workers in England and America are agreed about the ever-present danger of calcium deficiency in modern diets, and, as the reviewer points out, there is need for much more research work on the subject.

### Entry of *Filaria* Larvæ into the Body Cavity of the Mosquito

By M. O. T. IYENGAR

(Abstracted from *Parasitology*, Vol. XXVIII, 17th April, 1936, p. 190)

THE commonly accepted view regarding the manner of entry of larvæ of *Wuchereria bancrofti* (Cobb.) into the body cavity of its mosquito host is that microfilariae from human blood enter the stomach of the mosquito along with the blood meal and, after casting their sheath in the stomach, they penetrate through the wall of the stomach, enter the hæmocele and then find their way into the thoracic muscles. The time taken for the penetration of the stomach wall according to Looss (1914) is 6 to 12 hours. According to Bahr (1912) the worms appear in the thoracic muscles in 24 hours, while Lebrado (1905) recorded that in exceptional cases, worms were seen in the thorax 13 hours after feeding, but ordinarily the time interval was longer.

The author working with *Culex fatigans* Wied., experimentally infected with *Wuchereria bancrofti*, and with *Mansonia (Mansonioides) annulifera* Th. similarly infected with *Filaria malayi* Brug, has observed that in both instances the worms enter the hæmocele of the thorax of the mosquito in a remarkably short time, frequently in less than an hour after the infective meal. These studies are based on the examination of serial sections of bred mosquitoes fed on carriers with microfilariae and subsequently fixed at consecutive intervals of 10 minutes.

The manner in which the worms effect their entry into the hæmocele of the mosquito is different from the commonly accepted view on the subject. I find that when a mosquito sucks blood containing microfilariae, the worms that pass up the œsophagus tend to stay in the cardiac portion of the midgut immediately behind the proventriculus. This portion of the midgut which is situated within the thorax has a narrow lumen. By forming strong loops against the wall of the gut, the microfilaria stays in the cardiac region against the flow of the blood into the 'stomach'. It then travels forwards until it reaches the proventriculus. Microfilariae have frequently been observed in this position in sections of mosquitoes fixed within an hour after feeding. It has been further observed that the sheath of a microfilaria remaining in the cardiac midgut is softer than normally and shows a tendency to disintegrate. This is probably the effect either of the salivary fluid on the microfilarial sheath or of the secretion of the cells of the proventriculus. It would appear that the microfilaria penetrates through the wall of the gut near the proventriculus, or in the proventriculus itself, and escapes into the perivisceral cavity of the thorax. While doing so, it leaves behind it in the cardiac mid-gut its partially disintegrated sheath. I have, however, not yet obtained any sections in which the worm is seen partly within the proventriculus and partly outside it in the hæmocele. Many specimens have been observed within the proventriculus and immediately outside the proventriculus in the perivisceral cavity of the thorax. This has been observed both in *Culex fatigans* fed on blood with *Wuchereria*

*bancrofti* and in *Mansonia (Mansonioides) annulifera* fed on blood with *Filaria malayi*. In both instances the worms were seen in the hæmocele within a remarkably short time after the meal. No worm-larvæ were seen in the hæmocele of the abdomen, although they were fairly common in the hæmocele of the thorax.

The entry of the worms into the hæmocele of the mosquito may occur during or immediately after feeding. In many instances, worms were seen in the perivisceral cavity and in between the muscle bundles within an hour and in a few cases within 20 minutes of feeding. It would appear that the penetration of the gut wall is achieved mostly during the first two hours after feeding. In observations made with mosquitoes fed on the same carrier and dissected at varying intervals after feeding, it has been observed that the average number of filariæ in the thorax increases steadily till two hours after feeding, after which period there does not appear to be any appreciable increase in the number of worms in the hæmocele although the stomach contained microfilariae.

These observations show that the region of penetration of the gut wall by the microfilaria is not the 'stomach' but the cardiac portion of the mid-gut, especially the proventriculus. In none of the sections of mosquitoes examined in this series were any worm-larvæ seen in the hæmocele of the abdomen, although a large number were seen in the perivisceral cavity of the thorax. In the narrow lumen of the cardiac mid-gut, the microfilariae have the purchase to penetrate the gut wall by forming strong coils against the wall, while in the large cavity of the pyloric region such purchase is not available. It seems unlikely therefore that microfilariae could penetrate through the wall of the stomach as has been previously supposed. The short interval between the time of feeding and the occurrence of worm-larvæ in the thoracic muscles, the presence of microfilariae on the cardiac portion of the mid-gut and the proventriculus during and soon after feeding, the presence of many worm-larvæ in the perivisceral cavity of the thorax and their absence in the hæmocele of the abdomen all indicate that the principal point of penetration of the gut by the microfilariae is in the region of the proventriculus and not in the stomach.

Such of the microfilariae that do not stick to the cardiac region of the mid-gut and are driven down into the pyloric region, do not appear to have much chance of entering the hæmocele unless they happen to creep up into the cardiac region from the pylorus. Microfilariae, frequently with their sheaths intact, have been observed in the pyloric region for long periods, sometimes as long as two days, after a meal, without effecting an entry into the hæmocele. This indicates that a microfilaria that comes into the 'stomach' does not have much chance of entry into the body cavity of the mosquito.

Fülleborn (1927) mentions that the stomach contents of a mosquito soon after feeding shows a higher concentration of microfilariae than in the peripheral blood, and he thinks that this is due to a thickening of the blood as a result of the absorption of the blood plasma through the stomach wall of the mosquito, leaving the blood thicker than in the human carrier. Exact information is not available whether the thickening of the blood in the stomach of the mosquito soon after feeding is due to the absorption of the plasma through the stomach wall or to a process of coagulation of the blood caused by the digestive enzymes. Contrary to the views expressed by Fülleborn, however, I find that the concentration of microfilariae in the stomach contents of a mosquito which is susceptible to the infection is generally less than in the human carrier. This is due to the fact that all the microfilariae that are sucked up by the mosquito do not come into the stomach, and many of them stay in the cardiac region and enter the hæmocele without coming into the stomach. This may not happen in the case of *Dirofilaria immitis*, in which the microfilariae get into the Malpighian tubules after passing through the stomach. The present observations are solely with regard to the two species

studied, namely, *Wuchereria bancrofti* and *Filaria malayi*.

The perivisceral cavity of the thorax is surrounded on nearly all sides by the muscle bundles of the thorax, laterally by the two sets of vertical muscles and dorsally by the longitudinal muscle bundles. The worm-larvæ on escaping into the perivisceral cavity from the proventriculus get into the muscle bundles, either the vertical ones or the longitudinal ones. They move about in the spaces between the muscle bundles for some time before finally penetrating them. Until such time as they have secured a suitable position for resting, the worm-larvæ show strong coils or loops. When they penetrate into a muscle bundle, they work their way right into the middle of the bundle, stretch out parallel to the muscle strands and then become dormant.

### Ergotamine Tartrate for Migraine

(From the *Lancet*, Vol. I, 27th March, 1937, p. 763)

In 1934 Brock, O'Sullivan, and Young reported that ergotamine tartrate was effective in cutting short an attack of migraine. This discovery was made empirically after the trial of a number of substances reputed to be of value, and has since been confirmed by other workers. Dr. Mary E. O'Sullivan has recently reported the results of the trial of this remedy in a larger series of cases. Over a period of two years 97 patients were treated for 1,132 headaches, and 89 of these were relieved of a total of 1,042 attacks, which has been calculated as a saving of 39,000 hours of suffering. The subcutaneous method of administration of the drug was found to be more effective than the oral, relieving a larger proportion of patients and giving relief more quickly. An initial subcutaneous dose of 0.25 mg. was given and repeated after two or three hours if the headache persisted, or later if it returned. It was rarely necessary to give more than 0.5 mg. in a single dose, but the longer after the onset of the attack the treatment was given the larger the dose needed. For oral administration as many as five 1.0 mg. tablets might be necessary in a single dose to cut short an attack.

Dr. T. W. Gordon Kelly describes his experience of ergotamine tartrate in the treatment of his own migraine. Finding that this drug would cut short his headaches after many other remedies had proved useless he tried it as a prophylactic, taking 0.25 mg. subcutaneously at bedtime on the eve of a busy day, and found that in this way he could guarantee himself a day free from headache. After the frequent administration of ergotamine tartrate for many months he has experienced no ill effects, either immediate or remote. Dr. O'Sullivan discusses the prophylactic use of this drug and advises against it. It must be remembered that few sufferers from migraine have headaches as frequently as Dr. Kelly, and the regular administration of such a powerful substance for many years to avert attacks occurring only at intervals of weeks or months is clearly undesirable. Moreover, since in almost all cases an attack can be aborted within an hour or so by this treatment it is more economical to cut short an attack when it arises. The prophylactic use of ergotamine, therefore, though interesting is not widely applicable. Dr. Kelly confirms the observation that ergotamine tartrate is far more effective when given subcutaneously than when swallowed. This may be because during an attack of migraine when nausea is present, and still more after vomiting has occurred, absorption from the stomach is impaired. At this stage, in fact, ergotamine may make the vomiting worse without improving the headache. Dr. Kelly's note that sublingual administration is far superior to ingestion will, if generally true, prove of considerable value, since it will make the patient independent of the doctor's hypodermic needle, and enable an effective dose to be taken at the earliest possible moment. Also the effective dose is less, two tablets given sublingually being equivalent to the five or six found necessary if the drug is swallowed.

The mode of action of ergotamine is at present unexplained. It has proved useless for the relief of headaches due to conditions other than migraine and has no analgesic properties. Originally employed on the hypothesis that it inhibited the nerve-endings of the sympathetic it has been shown by P. Solomon to be without effect on the psycho-galvanic reflex, which is an index of sympathetic activity, and to relieve the headache without influencing the sympathetic nervous system as a whole. Dr. O'Sullivan believes that the action of the alkaloid is dependent on the humoral state of the organism, and is 'intimately connected with the complex mechanism of the still unexplainable migraine seizure'. Medical sufferers from migraine who are acquainted with the work of G. W. Pickering and others on the production of headache with histamine can hardly have failed to be struck by the resemblance between the brief headache induced by the intravenous injection of histamine and the migrainous headache. Histamine headache has recently been further studied by Clark, Hough, and Wolff, who have confirmed the observations of Pickering and Hess, and support their inference that this type of headache is due to dilatation and stretch of the pial and dural arteries and their

In migraine as in the histamine and increased pulsation of the temporal arteries occur, and it seems reasonable to infer that the state of the intracranial arteries is similar in the two conditions. It is possible that ergotamine acts by restoring tone to the stretched smooth muscle of the intracranial arteries, and observations on the effect of ergotamine on the histamine headache would be valuable. Ergotamine, though of outstanding value as a palliative, does not cure migraine, but the elucidation of its mode of action might bring us nearer to the understanding of the nature of the disorder. The suffering, social inconvenience, and economic loss occasioned by migraine must in the aggregate be enormous. A patient with the disorder in a severe form is subject at frequent intervals for the greater part of a lifetime to pain, discomfort, and incapacity as severe as those experienced by many patients with an intracranial tumour. Denied even the dignity of a bad prognosis he, or more often she, is likely to exhaust the sympathy of friends and relatives and to feel a recurrent nuisance—no more use, in fact, during the attack than a sick headache. To be able to offer such unfortunates a reliable palliative is much; but it is to be hoped that the need for systematic investigation of the ætiology of migraine will not be overlooked.

### Mandelic Acid in the Treatment of Infections of the Urinary Tract

By EDWARD N. COOK, M.D.

and

HENRY A. BUCHTEL, M.D.

(From the *Journal of the American Medical Association*, Vol. 107, 28th November, 1936, p. 1799)

In recent years the treatment of infections of the urinary tract has taken on a more scientific aspect. The older empirical methods which were efficacious in alleviating symptoms have been supplanted by newer forms of treatment which have a logical and predetermined basis and the value of which has been proved.

Since Shohl and Janney demonstrated that the growth of *Escherichia coli* was inhibited in urine at a pH of 4.6 to 5.0, the question of combating infection of the urine has come steadily to the foreground. Clark in 1931, searching for a means of acidifying the urine, used the ketogenic diet. Early observations soon revealed that a secondary factor was needed besides high acidity if bacillary infections of the urinary tract were to be eradicated. Fuller proved this secondary factor to be beta-hydroxybutyric acid. Helmholz and



Osterberg has definitely shown that a certain concentration of this acid, which is an end product of the ketogenic diet, is needed along with a certain pH of urine if negative cultures of urine are to be obtained.

As the ketogenic diet requires the most careful and skilful management if good results are to be obtained, and as it often causes distressing general and gastrointestinal symptoms, a vigorous search has been going on for a simpler and more easily managed means of treatment which would obtain the same results. When beta-hydroxybutyric acid is given by mouth to patients on a normal diet, it is oxidized in the body to carbon dioxide and water. Rosenheim, after experimenting with similar organic acids, found that mandelic acid could be given by mouth and could be recovered in the urine unchanged. Helmholz and Osterberg carried on a series of experiments in the laboratory and demonstrated very definitely that the usual bacilli found in the urinary tract were definitely killed by a 0.5 per cent solution of mandelic acid at a pH of 5.5. As with beta-hydroxybutyric acid, a lower pH will not require such a high concentration of the acid.

During the past twelve months we have been using mandelic acid or its derivatives with varying results. Our earlier work revealed its efficacy in approximately 50 per cent of cases, but later experience has shown that, with more careful management, better results may be obtained. We have given a 10 per cent solution of sodium mandelate, the dose being 1 ounce (30 c.c.) before meals and at bedtime. On this regimen the patient ingests 12 gm. of the drug daily. In order to render the urine acid, either ammonium nitrate or ammonium chloride was given in doses of from 4 to 6 gm. each day. Patients were instructed to take only five glasses of fluid daily in order not to dilute the urine. The results obtained were as follows: Seventy-five patients were given the drug, and the urine of sixty-one of them, or 81 per cent, was rendered sterile.

In an attempt to obtain the desired acidity of the urine without using an additional acidifying drug, Holling and Platt suggested the use of the ammonium salt of mandelic acid and reported good results in four cases. In one of these cases they found that the addition of ammonium chloride was required to obtain a satisfactory pH. We have given a 10 per cent solution of the ammonium salt of mandelic acid to five patients, and in all but one case a satisfactory pH was obtained without the addition of an acidifying drug. Another salt of mandelic acid is ethanolamine mandelate, and this too is designed to eliminate the use of a secondary drug. Ethanolamine mandelate was given to five patients, and negative cultures were obtained in three of these cases. In one case an acidifying drug had to be added.

Recently the ammonium salt of mandelic acid has been prepared in a 40 per cent syrup solution, and this has proved very efficacious. It was given to twelve patients with bacillary infections of the urinary tract, and in eleven of the cases the urine was sterilized. One patient required ammonium nitrate to bring about the desired acidity of the urine.

Offhand this form of therapy may seem extremely simple. The physician can write a prescription for mandelic acid and an acidifying drug and the cure is assured. This is not actually the case, however, and unless the physician is alert in his management of these patients and checks the pH of the urine daily, he will be greatly disappointed in the results he obtains.

In using the ketogenic diet, the diet itself aids greatly in acidifying the urine; with mandelic acid therapy this factor is lacking, and, if the mandelate plus the acidifying drug will not bring about a high acidity, other means must be instituted. In a few cases hydrochloric acid by mouth has been sufficient to increase acidity; in other cases an acid-ash diet has been tried, with varying results, and in still other cases the addition of the ketogenic diet has been necessary before the pH was low enough and bactericidal urine was obtained.

While mandelic acid therapy may supplant treatment with the ketogenic diet in approximately 75 per cent of the cases, it cannot replace it entirely. We believe

the main reason for this is the question of maintaining high acidity of the urine, as discussed in the previous paragraph. In conjunction with the ketogenic diet, mandelic acid will be extremely helpful. Often with the diet alone we were able to gain satisfactory acidity, but the concentration of beta-hydroxybutyric acid was not great enough to render the urine bactericidal. The addition of mandelic acid salts in this group of cases has already proved of great value. In one case in which diabetes insipidus was present as well as a urinary tract infection and the patient was on the ketogenic diet, extreme dilution of the urine prevented a sufficient concentration of beta-hydroxybutyric acid to obtain the desired results. The addition of sodium mandelate while the patient was still taking the diet sterilized the urine. Here, either form of therapy alone would have failed but the two used together were highly successful.

The urologic indications for the use of mandelic acid are the same as those for use of the ketogenic diet. To date, bacillary infections are readily attacked with this form of therapy while coccic infections are not.

As with the ketogenic diet, treatment of bacilluria associated with stone, stasis or marked prostatitis will be more difficult and will require the same thoroughness. The contra-indications to the use of mandelic acid are also similar to the contra-indications to the use of the ketogenic diet. However, in certain cases in which patients have gout, gastric or duodenal ulcer, or diabetes mellitus, when the use of the ketogenic diet is impossible, we believe that mandelic acid will be extremely beneficial and cause no distressing results. Helmholz and Osterberg have already shown in studies on animals that excessive doses of the drug will destroy the renal function and even produce death. In a series of normal individuals who were given the drug to determine the normal rates of excretion, determination of urea in the blood and of phenolsulfonephthalein excretion in the urine were made before the patients took the drug and after a week's ingestion of 12 gm. daily. At the end of the week the blood urea was found to be increased in all cases; the percentage of excretion of phenolsulfonephthalein was decreased. Whether or not this apparent decrease in renal function is attendant on a lowered intake of fluid or can be attributed to the drug itself we cannot say, but certainly we feel that one should be cautious in using the drug for patients who already have a reduced renal function and, particularly, for the aged. Further studies along these lines are now being conducted, and until experience with the use of this drug is greater, it must be used with care.

Most of our patients have taken mandelic acid or its derivatives without any untoward effects, less than 1 per cent having experienced any nausea or vomiting. Approximately one in ten have noticed some diarrhoea, but in most of these cases it was of a mild character; a few patients, however, did have from eight to fourteen stools a day and administration of the drug had to be stopped for a while. Its administration was resumed again later in decreased dosage without producing any ill effects.

In conclusion, we again wish to call attention to the importance of close observation and careful management of patients being treated with mandelic acid if the desired results are to be obtained.

### Significance of the Tuberculin Test

By F. E. HARRINGTON, M.D.

J. ARTHUR MYERS, M.D.

and

N. M. LEVINE, M.D.

(Abstracted from the *Journal of the American Medical Association*, Vol. 108, 17th April, 1937, p. 1309)

THE incidence of positive reactors to tuberculin among the children and young adults is the best criterion of the tuberculosis problem in any community. It is far superior to mortality rates, since many persons who have tuberculosis die of other causes and the death

certificates do not record the coexisting tuberculosis. One has only to consult post-mortem records to obtain abundant evidence of this fact. Moreover, the morbidity rate does not approach the accuracy of the tuberculin test as a criterion of the tuberculosis problem, since, in approximately 80 per cent of patients, symptoms are a late manifestation and do not bring patients to physicians for diagnosis until the disease is well advanced. Indeed, there is an average period of approximately two and one-half years before symptoms appear during which the disease can be located by modern methods. In most cases there is a much longer period after the tuberculin test is positive before there is any evidence of disease on the x-ray film.

In 1926 we published the results of tuberculin testing among school children in the city of Minneapolis, which showed that, of 2,118 tested, 47.33 per cent reacted positively. In the ten years that has passed since this work was done, much effort has been put forth and large sums of money have been spent to protect girls and boys against contamination with tubercle bacilli. While a good pasteurization ordinance was in effect in 1926, considerable milk that was not pasteurized was consumed by children, particularly when they were out of the city on vacations, and like instances. The pasteurization ordinance has continued in effect during the past ten years and in addition tuberculin testing of cattle has gone forward until the state of Minnesota has been accredited with reference to tuberculosis among cattle. Thus, contamination of children by the bovine type of tubercle bacillus, which results in a positive tuberculin reaction just as truly as the human type, has practically disappeared. The number of beds in the county sanatorium has been increased to approximately 700. While there were 500 beds in this institution in 1926, an additional 200 have been added; this additional 200 are more beds for the tuberculous than exist in some whole states. The United States Veterans' Bureau has developed a hospital for 176 beds for the tuberculous. However, this institution admits patients from other parts of this state and from other states. Most of the general hospitals have opened their doors to tuberculous patients so that physicians can isolate and treat their private patients. In addition to the facilities for isolation, ambulatory artificial pneumothorax has definitely increased in popularity on the basis of results obtained, and many persons have had their lesions treated in this manner before they became spreaders of tubercle bacilli, while many others with tubercle bacilli in the sputum have had their lesions quickly controlled and the sputum rendered negative. Thus a vigorous effort has been put forth to isolate patients with tuberculosis in sanatoriums and hospitals and to treat them in the homes so as to prevent them from spreading bacilli to their human associates.

The most outstanding work is the epidemiology that has been practiced over this period of years. As soon as a case of clinical tuberculosis is reported, an earnest attempt is made, first, to find the source of the disease; that is, to find the person with tuberculosis who spread tubercle bacilli to the present patient. In fact, 26 per cent of the cases of clinical tuberculosis reported to the health department in 1932 were detected in this manner. An attempt is made secondly to examine adequately all the immediate contacts who may have been contaminated by the present patient. When such contacts are not found to have tuberculosis in clinical form they are kept under close observation and examined periodically. This is done by private physicians for those who are financially able; for all others adequate clinics have been provided. It is not at all infrequent to find that the chest of a contact reacting positively to the tuberculin test and entirely negative to x-ray films and physical examination subsequently shows small shadows which make their appearance on the x-ray film long before symptoms or abnormal physical signs are present and long before tubercle bacilli are being eliminated in the sputum. Thus, many lesions which without such observation would become extensive and spread tubercle bacilli are brought under

control without ever causing the patient any illness or being a menace to the individual's associates.

Another phase of the epidemiologic work which has been extremely valuable consists of the use of the tuberculin test among children, many of whom had no known contact with open cases of tuberculosis. By finding the positive reactors and tracing back to the family and other close associates, many cases of open tuberculosis previously undiagnosed have been brought to light. In fact, in a special chest clinic at the Lymanhurst Health Centre, provisions have been made whereby x-ray films and clinical examinations are made of the chest of indigent persons. Moreover, physicians who have patients who can pay them a small fee but cannot afford x-ray films of the chest are permitted to send such patients to this clinic for free x-ray work. Indeed, during the present year x-ray film examinations have been made of approximately 5,000 persons in this clinic.

In addition to this method of finding unsuspected cases, the school board passed an order in 1933 requiring all employees of the school system to be adequately examined for tuberculosis. Thirty-six hundred such employees were examined, sixty-eight of whom showed shadows on the x-ray film which required clinical examination and observation to determine whether they were cast by tuberculous lesions and if so whether they were in a progressive or communicable stage. At the time this work was reported, six employees were found to have tubercle bacilli in the sputum and, since, two others have become spreaders of tubercle bacilli. The remainder are still under observation. While this number of communicable cases of tuberculosis may seem small, it is not difficult to conceive of them spreading tubercle bacilli to large numbers of girls and boys in the school system, since it has been estimated that one patient with open tuberculosis may eliminate from thirty to forty million tubercle bacilli daily.

Moreover, a very fine educational programme for physicians has been carried on during the past few years in which the department of health, the local medical society and the county tuberculosis association have co-operated. Tuberculin syringes were presented to each physician in the county and every two weeks tuberculin in a dilution of 1 : 1000 is delivered free of charge to the office of each physician who desires to use it. Free tuberculin to physicians for testing is not a new idea. In 1893 a law was passed in Denmark which provided for the expenditure by the minister of the interior of \$13,500 annually for five years to provide free tuberculin for testing cattle. In our present programme this has resulted in large numbers of tuberculin tests being administered by private physicians, whether engaged in special or general phases of medical practice, and many of the persons reacting positively to the test have had adequate subsequent examinations to determine whether tuberculosis is present in clinical form. This work by the private physicians has not only uncovered many previously unsuspected cases of tuberculosis but has also been of great educational value to the public, particularly with reference to the contagiousness of tuberculosis.

In Minneapolis, as in most cities, the work of controlling tuberculosis has of necessity been fragmentary. Not enough public health education has yet been possible to convince all persons of the value of periodic examinations for tuberculosis. Funds are not available to carry out an ideal programme among the indigent, but it is obvious that, if the work which is already under way could be extended to every home and every individual and proper co-operation were afforded, all the foci which are spreading tubercle bacilli could be quickly treated or isolated. The potential communicable cases could be kept under very close observation and in a relatively short time there would be no spreaders of tubercle bacilli.

Even though an ideal programme has not been possible, we were convinced that much had been done to prevent the spread of tubercle bacilli and that the tuberculosis problem had been definitely decreased. To measure the effectiveness of the programme in the past,



we had at our command a method that would give us very definite information, namely, the tuberculin test.

Soon after Koch presented tuberculin in 1890 it was learned that the dose recommended by him both for diagnostic and for therapeutic work often resulted in severe and harmful reactions. He used the subcutaneous method of administration. However, when Pirquet and Mantoux perfected the epidermal and intradermal tests, the amount of tuberculin used by them was found to be without harm. They were convinced that tuberculin is specific as a diagnostic test and through its use made a revelation that could not have been made in any other manner. While it was true that pathologists had already observed tuberculous lesions in large numbers of persons who had died of other causes, the tuberculin test revealed the fact that a high percentage of apparently healthy girls and boys had been infected with tubercle bacilli by the age of 15 years. We often think of Pirquet and Mantoux as believing that tuberculous infection was almost universal in young adults throughout the world, but this is far from true. Indeed, regarding his own observations, Pirquet said:

This high percentage cannot be considered as being the figure for all children, as very many cases are admitted into the hospitals because of tuberculosis.

Again he said:

The percentage of infected (reacting) children is a particularly high one in my table. In other cities it will hardly be as high because tuberculosis is notoriously prevalent in Vienna. Furthermore, all my patients belonged to the poorer classes. My statistics, therefore, lose in some degree their general value. Our children are infected at a much earlier age on account of the prevalence of tuberculosis among their parents. It is necessary to make similar studies in every city in order to ascertain the frequency of tuberculosis in general.

Thus Pirquet recommended the tuberculin test as the method of determining the incidence of contamination with tubercle bacilli in various parts of the world. Since the time of Pirquet and Mantoux the tuberculin test has been used very extensively, and at present it is recognized as a test having no superior in the diagnosis of any disease. Careful experimental studies and close observation on human beings have revealed the fact that when tubercle bacilli grow in the human body during the early stage of tubercle formation their protein sensitizes the tissues of the body. While microscopic evidence of sensitiveness of tuberculo-protein can be detected a short time after tubercle bacilli are introduced into the animal body, it is usually a period of approximately two or more weeks before the tissues are so sensitized as to react positively when tuberculo-protein is brought in contact with the skin through an abrasion or is introduced hypodermically within the layers of the skin. In the human body, where the time of exposure is quite accurately determined, it requires from three to seven weeks for the tissues to become so sensitized as to give such a reaction.

There is nothing ordinarily taken into the human or animal body which causes sensitization of the tissues to tuberculo-protein except tubercle bacilli themselves which are resulting in or have resulted in tubercle formation. It is possible to produce such sensitization artificially in the laboratory by the use of dead tubercle bacilli or the protein content of tubercle bacilli. However, this is usually of short duration because it is eliminated and not further produced, whereas that which develops through tubercle formation in the human body is usually thought to be of long duration because of continuous production from living bacilli. Since tubercle bacilli in tubercles and the lymph nodes of the primary complex often remain alive over long periods of time, they actually constitute manufacturing plants of tuberculo-protein in such quantities as to keep up the sensitization. Evidence has accrued to show that in some persons who are apparently well and who have previously reacted positively to the tuberculin test the sensitiveness of the tissues becomes so decreased that it is impossible to produce a reaction

even with large doses of tuberculin. How frequently this occurs is not known: It is a possibility that the tubercle bacilli which result in the tubercles of first infection may be destroyed, after which there is no longer a source of tuberculo-protein in the body and the tissues completely lose their sensitiveness. It has long been known that in overwhelming acute tuberculous processes, such as pneumonia, meningitis and miliary disease, the tissues are often desensitized so that it is impossible to obtain a positive reaction from the tuberculin test except when large test doses are used. Again, in chronic forms of tuberculosis during the terminal stage there may be enough tuberculo-protein produced and liberated to desensitize the tissues. Occasionally one sees a person with chronic tuberculosis, who is by no means in the terminal stage and yet the tissues fail to react to the tuberculin test. Apparently the number of such persons is small, and no one has made sufficiently long observations to determine whether in the same individuals there was at an earlier time definite sensitization of the tissues. It is probable that such cases may have become desensitized through the tuberculo-protein produced in their own bodies. These changes in human beings are not essentially different from those which the veterinarians observed in the nineties. Indeed, Bang of Denmark, in writing of the disadvantages of tuberculin in the testing of cattle, said:

In the first place the violence of reaction has no constant relation to the development of the disease. Farmers often believe the cow reacting violently to be extremely tuberculous and the one reacting feebly to be comparatively sound. The case is rather the reverse, but this is not constant either. Next, tuberculin is not absolutely to be relied upon. To be sure you will very seldom be mistaken in the conclusion that a cow which has shown an evident reaction is indeed tuberculous. I, for my part, know only three or four cases in which I could find no tuberculous deposits in such an animal, and in these cases the fault may be mine and not that of tuberculin, as it is impossible to examine every part of the body of a slaughtered animal. The tubercles may have been hidden in an unusual place, or they may have been so small or so fresh that they could not be discovered. This case then is a very rare one, though the unskilled observer, for instance, the butcher, may believe it to be a frequent one. Moreover, it must be considered that it would not be a disaster even if a sound animal should for once be considered tuberculous. Far more frequent is the case that an animal which has not reacted is proved by slaughtering to suffer from tuberculosis. But usually this has not the practical importance one would suppose it to have, as in the great majority of cases the deposits in question are very small, very old or greatly calcified, indicating that the process has become stationary. Experience teaches that such small deposits usually keep quite unchanged for a series of years and may even at length be healed. In fact, animals which have this form of tuberculosis will be quite harmless to their associates as they do not excrete tubercle bacilli. But there are also cases in which an animal suffering from far advanced and very contagious tuberculosis does not react to tuberculin. This is a very provoking fact; luckily, however, it happens but seldom, and we must be taught by it not to rely on tuberculin alone but to have recourse to clinical examination which will usually enable us to detect tuberculosis in such advanced forms. In the third case, tuberculin has the imperfection that reiterated reactions will not rarely call forth a temporary insusceptibility to the substance so that tuberculous animals will at length cease reacting to a new injection. This circumstance may occasion fraud in dealing in cattle, but as the fact is very inconstant the imposture will by no means always be successful..... But the imperfections of tuberculin mentioned here are eclipsed by its good qualities. According to my experience, which is founded on a very great number of autopsies, it is in 10 per cent of the cases at most that tuberculin will be at fault and it is only in a very small percentage of these cases that the fault will be of consequence. Tuberculin, therefore, in spite of its

imperfections, marks an immense advance in the diagnosis of tuberculosis. By its help we are able to discover a great number of cases of tuberculosis which were formerly absolutely concealed. Until something still better has been found, we must consider it to be our best weapon in the struggle against tuberculosis of cattle.

Thus those who believe that the finding of the occasional person with tuberculosis who does not react positively to tuberculin is a new discovery may be surprised to learn that this fact was known to the veterinarians forty years ago. Moreover, one may look on the occasional failure on the part of tuberculin as insignificant in a control programme just as the veterinarian does.

The tuberculin test is extremely valuable in determining who in a family or in a community has foci of tubercle bacilli in the body. A positive reaction is diagnostic of the first infection type (primary complex) somewhere in the body. This type rarely causes significant illness but is always the forerunner of reinfection destructive forms of disease, both acute and chronic, when this type develops. The tuberculin test, therefore, serves as a screen to select those who have been infected through direct or indirect exposure and who should be carefully examined and kept under close observation thereafter for the development of clinical disease.

During the months of April and May 1936, we tested 4,549 children in the schools in which testing had been done ten years ago. There has been a sharp decrease in the percentage of children reacting positively to the test, as shown in the accompanying chart, indicating that the environment of the present school children has been very much better so far as exposure to tubercle bacilli is concerned than was that of the children in the same age period ten years ago, when 47.83 per cent reacted positively. In the accompanying table the positive reactors have been grouped according to age. To expect another sharp decrease in the next ten years would not be illusory, provided the present programme of preventing contact of children with open cases of tuberculosis can be continued and extended.

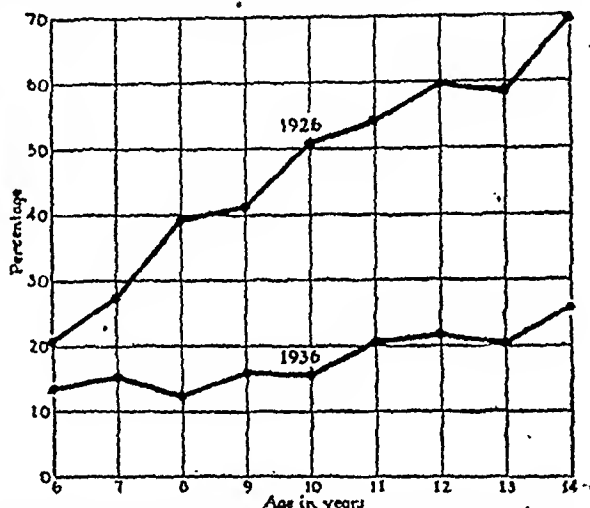
In many parts of the country, the number of positive reactors among children and young adults is decreasing. In these places, programmes similar to that employed in Minneapolis have been in effect so as to reduce definitely the number of communicable cases of tuberculosis through isolation, treatment and other measures, thus creating an environment for children with far fewer tubercle bacilli than that of former years. For example, in Detroit in 1930, of 5,044 children examined, 54 per cent reacted positively while in 1935, of 5,504 children examined, 26 per cent reacted positively. While the rate of decrease in positive reactors apparently has been rapid, it should be accelerated, as the number of communicable cases of tuberculosis in any community is decreased through serious effort to locate and render their disease non-communicable or to isolate them. Obviously, the lower the incidence of tuberculous infection in any community, the more valuable the tuberculin test; likewise, the problem of examining and keeping under close observation all the positive reactors becomes a physical possibility.

The tuberculin test is easily administered and the cost is small, but other phases of the examination, such as making of x-ray films, are more expensive. Therefore, with relatively small expense and in a short time through the tuberculin test, one can select those who need further examination. For example, if in a given community 15 per cent of the children and young adults react positively to the tuberculin test, one immediately eliminates the 85 per cent who at that time do not need any further examination for tuberculosis.

Some workers have found more positive reactions with old tuberculin, while others have reported more with purified protein derivative. The recent work of Plunkett showed that when the larger doses of the two preparations are employed simultaneously at different sites on the same individuals there is essentially no difference in the percentage of positive reactors. The potency of old tuberculin from various drug houses

varies considerably. This is a rather serious objection. The chief advantage of purified protein derivative is that it is standardized, so that its potency is the same wherever it is used. This, of course, insures more uniform results than when old tuberculin is used. The only objection to purified protein derivative is its high cost. In our present study we employed old tuberculin secured from the Saranac Laboratories, since this tuberculin had been used in our study of a decade ago.

The present method of administering the tuberculin test in two doses is objected to by many workers, since all who do not react to 0.01 mg. of old tuberculin or the first dose of purified protein derivative should have a second dose consisting of a full milligram. For example, if tests are to be made on 100,000 children in a community where only 10 per cent react positively to the first dose, 90,000 must be retested. In short, the expense and time of testing is nearly doubled. In our survey we employed an initial dose of 0.1 mg. and retested all the negative reactors with 1 mg. While each of us was able to administer from 300 to 500 tests in an hour, still much time could have been saved if a single test dose had been used. Many workers use 0.1 mg. of old tuberculin as the first and final dose; a few use a full milligram as the only test dose. Long and his co-workers are about to present a single test dose of purified protein derivative, which should greatly facilitate tuberculin testing in this country.



Percentages of the children acting positively to the test in 1926 and 1936.

Some physicians prefer other methods of administration than the intracutaneous, and also some persons object to the use of a hypodermic needle. For example, Chadwick, Pope and their co-workers use the epidermal method of Pirquet with excellent results. Slater, by carefully administering tuberculin by the epidermal method on one arm and by the intracutaneous method of Mantoux on the other arm, finds a difference in positive reactions of only 1 per cent in favour of the intracutaneous method. However, in the hands of less experienced workers a larger discrepancy is usually reported. For those who even object to the scarification of the skin necessary for the epidermal test, a modification of the percutaneous test described by Lovett and the tape test by Wolff are valuable. Indeed these tests, when carefully administered, closely approximate in accuracy the intracutaneous test. However, their administration is slightly more time consuming.

The specificity of the tuberculin test has been demonstrated on such a large scale in animals that it can no longer be questioned. When Pearson and Cotton began using the tuberculin test to detect tuberculosis in cattle in 1891, they were convinced of its specificity. Although for the next two or three decades much opposition was voiced, those who were convinced of its specificity brought forth irrefutable evidence. For example, in some places 92 per cent of the cattle reacting positively to the test were found at post-mortem

examination to have macroscopic tuberculous lesions. In political divisions where tuberculin testing of the cattle herds was repeated periodically, the time arrived when less than 50 per cent of those reacting positively showed macroscopic lesions at post-mortem examination. Another great controversy was initiated by the opponents of the tuberculin test on the ground that more than 50 per cent of the animals slaughtered did not show lesions and therefore did not have tuberculosis, whereupon the proponents called attention to the fact that tuberculous lesions begin their development in a microscopic way and that the test is so delicate that even such lesions are detected by it. They were simply catching up with tuberculosis; that is, they were diagnosing it before it could be seen with the naked eye. It was then their aim to reach the time when all tuberculosis among cattle would be diagnosed while the lesions were still microscopic and long before those animals with such lesions could spread their bacilli to others. They have now reached the ultimate goal; namely, complete eradication of tuberculosis from large numbers of herds and from all the herds in a few entire counties. All that remains is to use the same method that has led to this goal in the remaining parts of the country and tuberculosis will be completely eradicated from our animal herds. Indeed, by the close of the year 1937 all states will be accredited, with the possible exceptions of South Dakota and California. This is the greatest revelation of all time with regard to tuberculosis control, and it is one of the revelations of the tuberculin test. Without this specific test it would not have been possible to eradicate tuberculosis from the animal herds.

The tuberculin test is no less specific for human beings than it is for cattle. Indeed, the veterinarian uses tuberculin made from the human type of tubercle bacilli for testing cattle just as we do for testing human beings.

Through the tuberculin test and slaughter of the positive reactors, the veterinarian quickly recognized a long latent stage in tuberculosis but did not complicate the situation by calling it infection rather than disease. The following quotation from the report of a committee headed by Dr. John R. Mohler is significant: 'When the tuberculin test is applied to cattle for any purpose it should be clearly understood that the reacting animals are to be regarded in every sense of the word as recognized cases of tuberculosis, which under an obligatory notification law must be reported at once to the proper authority.' In human medicine, one must recognize the fact that a positive tuberculin reaction indicates the presence of tuberculosis somewhere in the body. For too long the fact has been overlooked that this disease passes through many phases and stages from the time the neutrophil phagocytoses the first tubercle bacillus until the disease takes the life of the individual. Unfortunately, it was not considered that a person had tuberculosis until he was ill, when in reality the disease had existed since the tubercle bacilli were first focalized by the neutrophils. About two years ago a committee of the Minnesota Trudeau Medical Society strongly recommended that all persons who react positively to tuberculin be reported to the health department. The society rejected the report and similar action has been taken against such committee reports in other states. However, in Minneapolis the commissioner of health strongly encourages physicians to report all positive tuberculin reactors even though the disease cannot be located by present methods of examination. Such reports are of great help to the health officer, who is often able to assist the private physician in finding sources of exposure. A list of positive tuberculin reactors is also valuable because they are potential cases of clinical tuberculosis and should be examined periodically.

Although the reporting of persons who do not show any evidence of tuberculosis except the positive tuberculin reaction is strongly opposed at the present time, it must eventually be considered as an important part of a tuberculosis control programme. Here again we are only recommending what the veterinarian has found

so effective in eradicating tuberculosis from the cattle herds.

Through the tuberculin test and slaughter of the positive reactors, the veterinarian learned that, once tubercle bacilli gain lodgment in the animal's body, an actual or potentially serious condition exists. Of this Pearson and Ravenel say:

It is a disease that runs a chronic course with but little tendency to heal, although it is sometimes latent for a long period. Even if the animal recovers, it is not thereby rendered immune to another attack as is the case with hog cholera, anthrax, influenza and numerous other diseases. Therefore, when tuberculosis is introduced into a herd it is not self limiting and its tendency is constantly to spread and with a degree of rapidity that depends largely upon the sanitary conditions to which the herd is subjected.

Again they say:

After gaining a foothold in the body and after one or more tubercles are formed, the bacteria may invade other regions by passing through tissue, by being distributed mechanically in cavities or in canals, by being transported in currents of lymph or in the blood.

Moore says:

It is not known how long the lesions may lie dormant, but we have individuals where they sprang into activity after three and one-half years, and also a case where an apparently healed, calcified tubercle contained living virulent tubercle bacteria three years after the cow ceased to react.

In the human body one can no longer look lightly on the primary tuberculosis complex when its presence is indicated by the positive tuberculin reaction.

The next step in our present survey consisted of making x-ray films of the chests of the children who reacted positively to the tuberculin test. Although the fact is well established that the positive tuberculin reaction establishes the presence of a primary complex somewhere in the body, the lesions that constitute this complex usually are not of clinical significance except in a few cases for a brief period of time as allergy appears, when there may be an elevation of temperature. Subsequent to this period there are no clinical manifestations. The x-ray film of the chest fails to reveal the location of the primary complex in 75 per cent or more. Moreover, knowing the location of the complex is of no material assistance to the clinician.

We no longer recommend making x-ray films of the chests of children except for the detection of developing reinfection or the clinical type of tuberculous lesions. Since this type of lesion is found in the chests of children who are positive tuberculin reactors only once in 2,000 or 3,000 examinations, it is hardly worth while to make x-ray films of the chests of children, since there are other age periods in life when films reveal so much more evidence of clinical tuberculosis. For example, during the high school age period one may expect to find evidence of developing clinical disease in one in every 500 to 800 positive reactors. In the college age period a larger number of positive reactors is found to have developing or well established clinical disease, whereas in the twenties and thirties one may find a case of clinical tuberculosis in every 100 or 200 positive reactors.

The form of tuberculosis that causes illness, requires treatment and disseminates tubercle bacilli to other human beings is largely a disease of adult life. Our chief reason for making x-ray films of the chests of the positive reactors in this study was to obtain confirmatory evidence concerning the absence of clinical disease in the chests of children which we have previously observed in other groups.

Considerable controversy has arisen regarding the necessity for treating children who react positively to the tuberculin test whether or not the primary complex is located by further phases of the examination. However, sufficient evidence is now available to justify the statement that active treatment is not necessary for such children. They do just as well in their homes as they do in institutions, and they do just as well in

school and other usual activities as they do lying in bed at home. While children with the first infection type of tuberculosis in the inflammatory stage may occasionally have tubercle bacilli revealed in the gastric contents, they rarely cough or expectorate; therefore they are not public health menaces. Active treatment was not recommended for a single child found in this study to react positively to tuberculin, because our observation with all forms of treatment on similar groups of children over a period of fifteen years has conclusively proved that treatment is of no avail.

This does not mean that our survey was of no value, for finding the positive reactors gave us two very definite leads that are of great importance in the tuberculosis control programme. First, we learned from each positive reaction that the child had been exposed to a communicable case of tuberculosis. While it is true that a visit to a neighbour or a distant relative may suffice to set up a focus of tuberculosis in the child's body, it is also true that some positive reactors are in close association with persons who have communicable tuberculosis which may never have been diagnosed. Therefore, one of the prime objects of this survey was to seek the source responsible for the disease in each of these children and to stop any further exposure by isolating or treating these persons. This is being done as fast as possible.

Second, close observation is important for every child who reacts positively to the tuberculin test as soon as young adult life is reached, since the fact has been well established that in a good many such children clinical disease develops during adult life. Indeed, in a group of children (average age about eight years) reacting positively to the tuberculin test in 1921-1922, we have found that approximately 10 per cent have already developed clinical tuberculosis. In other groups reacting positively in each succeeding year, corresponding percentages have developed a manifest reinfection type of lesion.

Therefore, all these children who have reached the period of adolescence and all others as soon as they approach this period should have annual x-ray examinations of their chests. In this age period and thereafter the x-ray film is indispensable in the tuberculosis control programme. When reinfection or clinical pulmonary tuberculosis is found to be developing, treatment should be instituted at once, for this is the form of disease that causes most of the serious illness and death from tuberculosis. By such a programme of observation, practically all children who develop clinical disease will have it detected before symptoms are present and before it has become communicable. This is the time when tuberculosis can be treated most successfully in a very short time, and usually treatment will prevent the individual from falling ill or from becoming a disseminator of tubercle bacilli. Here collapse therapy, particularly artificial pneumothorax, is the most effective form of treatment and often can be instituted and maintained on an ambulatory basis. When such a programme of breaking contact is carried to its logical conclusion, tuberculosis must rapidly disappear.

In the whole educational campaign against tuberculosis in recent years, nothing has been so valuable or so significant as bringing to the attention of the public the fact that this disease is contagious. Indeed, it was the veterinarians' early recognition of this fact that added much to the success of their work. Moore says: 'Tuberculosis has gradually grown into many herds of dairy cattle. It should be guided in such a way that it will grow out. The secret of accomplishing this is to prevent the spread of tubercle bacteria from the present infected cattle so that with the disappearance of the animals now infected this destructive disease will be no more'. In our epidemiologic work we are practicing the veterinarian's method of finding cases of tuberculosis and breaking contact with others.

The Bang method of control provided that all calves from cows reacting positively to the tuberculin test should be removed immediately after birth and fed on milk that had been heated or milk from cows that did not react positively to the test. When these calves

reached the age of about four months they were tested again and periodically thereafter. Throughout the remainder of their lives they were kept away from other animals reacting positively to the tuberculin test. This is essentially the same procedure that Grancher, Bernard, Hess and many others in more recent times have employed for infants. Where this procedure has been practiced even in a very incomplete manner there has been a sharp reduction in mortality, morbidity and the development of primary complexes from tuberculosis. In fact, Boynton has pointed out that in the state of Minnesota the mortality from tuberculosis in infants decreased 88 per cent from 1916 to 1933.

We know all that is necessary in order to control tuberculosis in the human family, and the method now in use has been proved to be sound. If this method is employed everywhere no immunizing agent will be needed. In fact, to the present time no satisfactory immunizing agent has been developed. The veterinarians have made numerous attempts to immunize cattle against tuberculosis. As early as 1913, Moore

said: 'It is impossible in a work of this kind to enter into a discussion of the theories of immunity, but the fact that individuals who have suffered from an attack of tuberculosis and have recovered at least temporarily are not protected against a subsequent attack or recurrence does not argue in favour of a protective vaccination. Success may be attained but at present there seems to be no method that can be recommended to the cattle owner for successfully vaccinating or immunizing his animals against tuberculosis.'

Since Moore's statement, other attempts have been made, including such preparations as Calmette's vaccine, BCG. After sufficient trial, however, the veterinarians of America have not adopted BCG as a satisfactory method of prevention. They have had a better opportunity to observe the effects of BCG on cattle than we could ever hope to have on human beings. The veterinarian's experience and his record of success in controlling tuberculosis, which is the best of any group of workers of any time, should discourage every physician from administering BCG to children. Certainly a preparation that the veterinarian considers unsafe and ineffective for cattle should not be used in an experimental way on the children of the United States. To prove the efficaciousness of an immunizing agent for tuberculosis in the human body would require decades; in fact, before this can be proved, our present method should reduce the disease in the human family to one of minor importance.

## Reviews

**ROSE AND CARLESS' MANUAL OF SURGERY FOR STUDENTS AND PRACTITIONERS.**—By C. P. G. Wakeley, D.Sc. (Lond.), F.R.C.S. (Eng.), F.R.S. (Edn.), and J. B. Hunter, M.C., M.Chir. (Cantab.), F.R.C.S. (Eng.). Volumes I and II. Fifteenth Edition. 1937. Baillière, Tindall and Cox, London. Pp. xii plus 1618, with 948 figures in two volumes. Price, 30s.

THE first edition of Rose and Carless was published thirty-nine years ago; 'it was necessitated by the revolutionary changes that followed the teachings and practice of Lister and made all existing surgical textbooks of little use', to quote Carless' own words. Since the publication of the fourteenth edition in 1933—which was incidentally the first one in which he had taken no active part—Carless has died, and a connecting link with Lister has been broken, as for many years Carless was a close associate of the world's greatest surgeon.

This book has always been a popular one with the student and young surgeon, and rightly so. No changes that could be called revolutionary have taken place during the last four years, but in every branch of



surgery advances have been made and this has necessitated much re-writing in every section of the book. The sections dealing with the infection of wounds have been entirely recast and a standardized bacteriological nomenclature adopted; in the past, surgeons and surgical writers have been particularly careless in this matter and appear to have adopted the view that the minutiae of bacteriological nomenclature were beneath their notice.

The length of the book has been increased by some hundred pages, but it is cheering for the student, groaning under the steadily-increasing load of the present-day curriculum, that this increase in length is mainly due to the addition of over two hundred illustrations.

There is a section on tropical surgery which makes the book more complete for the student and surgeon working in India. This has been written by Sir Frank Connor and is therefore free from the solecisms usually committed by the surgeon of temperate climates when he comes to write of tropical conditions. The section is however not entirely free from mistakes: figure 938 has the correct caption but is referred to in the text as if it were a case of oriental sore, which it was not. For the treatment of this condition radical surgical measures are not advocated.

There are contradictions here and there; for example, under the diagnosis of liver abscess on p. 1234 it is stated that aspiration 'should not be utilized *unless one is fully prepared for immediate operation in the case of pus being found*' (authors' italics), whereas on the next page aspiration is referred to as a possible alternative form of treatment to open operation and Sir Frank Connor rightly advocates aspiration as the treatment of choice, preferring it in nearly every instance to open operation.

There are numerous excellent plates: most of these are in colour, others are reproductions of skiagrams, but all are good and of quite definite practical value. The senior editor says in his preface that he thinks more trouble has been taken over this edition than over any of the previous ones. We can well believe this; the result certainly justifies this trouble, and a book has been produced that is worthy of its special title, the Coronation Edition.

**MANUAL OF PRACTICAL ANATOMY.**—By J. E. Frazer, D.Sc., F.R.C.S., and R. H. Robbins, M.A., M.D. Volumes I and II. Volume I:—Upper Limb, Lower Limb and Abdomen. Volume II:—Thorax, Head and Neck, Central Nervous System, Eye and Ear. 1937. Baillière, Tindall and Cox, London. Pp. ix plus 536, with 281 illustrations in volume I, and viii plus 455, with 290 illustrations in volume II. Price, 10s. 6d. for each volume

THERE are many textbooks of anatomy available for the student and it would be hard to justify the addition of yet another, but in the case of 'guides to practical anatomical studies' there is not the same wide selection and therefore a new recruit is certain to be received with interest.

The authors of this manual are teachers of anatomy at St. Mary's Hospital and the senior author's name is already associated with another important anatomical publication *Buchanan's Manual of Anatomy*, the last edition of which he edited. The two volumes under review may be looked upon as complementary to this textbook of anatomy, and are designed for the student to use in his practical anatomical studies in the dissecting room.

There is a short but very excellent introduction: this commences with a few words of exhortation to the student to encourage him in his anatomical studies. We feel that the authors are attempting to counteract the rather foolish statement sometimes made by the type of young surgeon who delights in being paradoxical, that the first thing a surgeon has to do is to forget his anatomy. These authors say 'There are practically none of these details that cannot be, and are not, utilized by the clinician—if he knows them' (our italics).

Other matters which are dealt with in this introduction are the meaning of such words as 'medial' and 'lateral', 'anterior to', 'behind', etc. All very simple expressions, but not always understood by the student when he starts his studies, and this lack of exact knowledge often handicaps him for a very considerable time. The careful definition of the *apparently* obvious, which provides the keynote of the authors' treatment of the subject, makes these volumes particularly suitable for medical students in this country, many of whom have a comparatively low standard of general education; but by this we do not mean to suggest that they are unsuitable for those seeking the highest qualification.

The 'Birmingham Revision' anatomical nomenclature is used throughout. There is a glossary in which terms of the B. N. A. nomenclature that are in common use are explained.

The volumes are of handy size for use in the dissecting room; they are well illustrated and colour is used where this clarifies the diagram. We can strongly recommend this book for the use of students in this country.

**HANDBOOK OF PHYSIOLOGY AND BIOCHEMISTRY.**—By the Late W. D. Halliburton, M.D., LL.D., F.R.C.P., F.R.S., and R. J. S. McDowall, M.D., D.Sc., F.R.C.P. (Edin.). Thirty-fifth Edition. 1937. John Murray, London. Pp. xi plus 973. Illustrated. Price, 18s.

THIS handbook was first published eighty-nine years ago and it is of interest that the publishers no longer feel justified in printing in full the very long list of previous editions. Since 1924 the present is the sixth edition. The principle adopted, of printing comparatively small editions in order that frequent revisions may be carried out, is a very sound one.

Physiology and biochemistry are very closely linked sciences and for years physiology has been displaying a more and more pronounced biochemical tendency; it is significant that in this edition the word biochemistry has been added to the title, but this addition does not indicate any radicle change in the scope of the book.

Important new work has been incorporated in this edition, especially that connected with sex hormones, vitamins and the humoral transmission of nerve impulses. The sections dealing with blood chemistry have recently been revised, but some further revision of those on blood cytology seems to be indicated. Five millions per c.mm. cannot any longer be considered the 'normal' red cell count, nor 14 grammes the 'normal' haemoglobin content, and the plate showing different forms of leucocyte would have been more useful had the cells been stained by methods now more commonly used by haematologists.

It is the ideal handbook for the undergraduate student: it contains just as much as he wants for satisfying his examiners, and it gives him a sufficient insight into the subject to make him understand the dysfunction that will follow the pathological processes about which he must learn in his later studies and with which he has to deal in his clinical practice.

L. E. N.

**MATERIA MEDICA, PHARMACY, PHARMACOLOGY AND THERAPEUTICS.**—By W. Hale-White, K.B.E., M.D. (Lond.), M.D. (Dub.), LL.D. (Edin.). Twenty-third Edition. Revised by A. H. Douthwalte, M.D., F.R.C.P. 1937. J. and A. Churchill Limited, London. Pp. xi plus 562. Price, 10s. 6d.

THIS book has long been accepted as the standard textbook on the subject in many medical schools in Great Britain and the Empire. It is also a book which the practising physician likes to keep in his library for frequent reference. There are many more complete books of reference, but for obtaining a quick view of essentials it is hard to find a better book.

The *Addendum*, 1936, of the *British Pharmacopœia* is given as the main reason for a new edition, but new

matter unconnected with this addendum has been included.

Many of the non-official drugs used in tropical practice are included and accurate details given. We notice however that carbon tetrachloride, as an anthelmintic, is included but not the now-well-established tetrachlorethylene. There seems to be some confusion about the dosage of plasmochin: '0.06 grm. daily' is given as the dose; later 0.06 gramme thrice daily is referred to, and the statement is also made that '0.2 grm.' in a single dose 'destroys' a subtertian infection (and quite possibly the patient as well, we might add). This was however the only mistake (in our opinion) that we were able to detect.

The present edition most certainly maintains the great reputation of this book. The publishers are to be congratulated on producing a book of this quality at such a reasonable price.

**ORGANIZATION, STRATEGY AND TACTICS OF THE ARMY MEDICAL SERVICES IN WAR.**—By T. B. Nicholls, M.B., Ch.B., Lieut.-Col., R.A.M.C. 1937. Baillière, Tindall and Cox, London. Pp. xlv plus 372. Price, 10s. 6d.

THIS book, which must have been the result of much labour and research, is written by a senior officer of considerable experience in war, who was fortunate in that he had practical experience as a serving officer in most medical units in the Great War and fulfils at long last an essential need and much felt want.

It is complete and exhaustive in detail and presents a concise picture of the rôle of the medical services in war, and should be in the possession of all serving medical officers—not only as a 'ready reckoner' when faced with field problems but as a *vade mecum* which will save an infinity of trouble in this search for the many regulations and official books of reference where the requisite information is scattered over such a wide field of military topical publications. The author writes clearly and always to the point and has adhered throughout strictly to the regulations, yet at the same time does not hesitate to place before the reader where there is division or divergence of opinion in the various opposite schools of thought on some of the important problems of medical evacuation—such as the necessity for the walking-wounded collecting post, the work that should be done both medically and clerically at an advance dressing station, the headings to be adopted when writing a medical appreciation, and the drafting of a R. A. M. C. (or medical) operation order particularly as regards 'intention'; on the other hand he stresses with remarkable perspicuity most matters of importance and the reviewer himself, an officer of 34 years' service with unique experience in the Great War, finds admirable emphasis always in the right direction, such as the responsibilities of regimental and medical stretcher-bearers which are clear cut, the duty of 'A' branch of the staff to provide extra personnel to assist the regimental stretcher-bearers when heavily pressed and the necessity for the use of reserve troops as stretcher-bearers to implement the medical stretcher-bearers when casualties are unusually high and assistance is required between the R. A. P. and A. D. S.

It is most gratifying to find that the medical services have nothing to do with the burial of the dead or their effects, that it is as well for the medical commander to retain some record of his requests for extra requirements for the sick and wounded, as in the cold light of official courts of inquiries after all is over he may be liable to be offered on the 'horns' of the altar or 'hanged drawn and quartered' as the scapegoat for the failure of adequate transport and medical supplies, as has so often happened in the past.

The book is planned in four sections:

Part I. General organization and administration.

Part II. The medical units, their composition, organization and administration.

Part III. Medical tactics and strategy.

Part IV. A selection of exercises and problems illustrative of the preceding parts.

Although the author admits this arrangement has involved a certain amount of repetition, this is to some extent unavoidable in a military publication and there is no redundancy and the sequence of chapters makes easy reference—meticulous care has been given to statistics, data, and the calculation of casualties.

The chapters on examination for promotion and the various administrative exercises, which include those carried out in India, are very thorough and comprehensive.

The severest critic will find little to cavil at or find fault with.

The number of beds in general hospitals required is normally calculated on 10 per cent of the total strength of the force. The author considers that in addition to this number a further reserve of beds of 33½ per cent should also be available; this is thought high, particularly as he later shows that 18 per cent of sick and wounded are returned to duty from front-line duties.

It is a pity that only a short section is given to medical dispositions with mechanized formations and tank units and the removal of casualties by air although it is recognized that the cavalry field ambulance can well fulfil this rôle. Whether a protected motor ambulance or 'medical tank' should claim the protection of the general convention, as a practical issue, seems beside the point, as once in the firing line all vehicles would be treated alike.

The inclusion of an administrative exercise on combined landing operations with expected opposition would have been of the greatest benefit, but the importance of disembarking medical units early is happily emphasized. The tendency to embark fighting troops without their authorized medical units invariably leads to disaster; this applies to sanitary or field hygiene sections.

The chapter on how best to write a medical appreciation is excellent. The drafting of the medical operation order appears a little too profuse.

It is regretted that the importance of allotting more transport to the casualty clearing station in war establishments is not advocated. In the Great War this was a mobile unit but with its mobility dependent on 'Q' branch of the staff, with unhappy results in rapid advance or retirement, and the position is but little better now.

This book has been reviewed with much pleasure and instruction.

L. V. T.

**MEDICAL RESEARCH COUNCIL. THE RELATIONSHIP OF THE IODINE CONTENTS OF WATER, MILK AND PASTURE TO THE OCCURRENCE OF ENDEMIC GOITRE IN TWO DISTRICTS OF ENGLAND.**—By the Committee on Iodine Deficiency and Thyroid Disease, with sections by M. Young, and M. G. Crabtree and E. M. Mason. Special Report Series, No. 217. Published by His Majesty's Stationery Office, London. 1936. Pp. 20. Price, 6d.

'THE problem of the accurate determination of minute quantities of iodine, such as are to be found in water and in most foodstuffs, is generally recognized to be one of great difficulty. It was considered that the methods employed in the earlier investigations were not entirely above suspicion and that any further work would be greatly enhanced in value if its analytical basis could be securely established. With this end in view, a special committee of chemists was therefore entrusted by the Medical Research Council with the task of evolving an adequate method for the determination of iodine in biological materials. The outcome of the work was the report (No. 201 in this series) by Mr. C. O. Harvey, of the staff of the government laboratory, embodying the detailed description of a standardized and accurate method of analysis; this method has been used throughout the present investigation and has proved eminently satisfactory.

The work now described was directed towards a possible explanation of the remarkable differences in



the incidence of thyroid enlargement among girls of school age in English counties. It is certainly a striking fact that such large differences should exist. It was shown in the present investigation, for instance, that whereas only 3 per cent of the children in certain Suffolk villages are so affected, the corresponding figure for part of Somerset is 56 per cent. It was this large variation in incidence which suggested the need for estimating the amount of iodine in the drinking water and milk, and in the pastures on which the milch cows are grazed, in the two counties.

The results embodied in the present report give general confirmation of previous work, in that environmental deficiency of iodine (as indicated by the iodine content of the local water) is once more shown to be associated with a high incidence of goitre. They show at the same time, however, at least in so far as the minor degrees of iodine deficiency encountered in this country are concerned, that the actual amount of iodine in the environment is not simply and directly related to the intensity of incidence of goitre.

**MEDICAL RESEARCH COUNCIL. MEDICAL USES OF RADIUM: SUMMARY OF REPORTS FROM RESEARCH CENTRES FOR 1935.** Special Report Series, No. 216. Published by His Majesty's Stationery Office, London. Pp. 38. Illustrated. Price, 1s.

'THIS report summarizes the research done during 1935 with radium and radium emanation distributed by the Medical Research Council to selected centres throughout Great Britain and Ireland; it thus continues the accounts given in the thirteen similar reports which have preceded it. In addition to a series of laboratory experiments on the fundamental aspects of irradiation and the biological effects of radium on cells and tissues, it gives particulars of new methods used clinically for the radium treatment of cancer and some other diseases, together with statistical data relating to the after-histories of patients with cancer who had been treated by radium in earlier years. The whole scheme of experimental and clinical work is supervised by the Radiology Committee, to whom the Council are indebted for the preparation of these reports. No account is included here of the research work in the treatment of cancer by "radium beam therapy" which the Council and other bodies are assisting under independent arrangements'.

**MEDICAL RESEARCH COUNCIL. A DIETARY SURVEY IN TERMS OF THE ACTUAL FOODSTUFFS CONSUMED.**—By E. P. Cathcart and A. M. T. Murray. Special Report Series, No. 218. Published by His Majesty's Stationery Office, London. 1936. Pp. 56. Price, 1s.

'In the present report the authors bring together the figures obtained in their earlier investigations made at St. Andrews, Cardiff and Reading, and analyse them as a whole from a new angle. In the earlier reports attention was in the main directed to the nature of the food consumption in terms of protein, fat and carbohydrate, irrespective of the sources from which these principles were derived. In the present report, these data have been interpreted in terms of some of the principal foodstuffs purchased in the course of everyday house-keeping. The results of studies of the type of food eaten by a number of Glasgow families, and also by some women students, have been added to those obtained in the other localities. Thus it is evident that a view of the actual foods eaten by a fairly large section of the population has been obtained in this work.

One of the main points of interest brought out in the earlier investigations was the relative constancy in the distribution of calories between protein, fat and carbohydrate eaten by people in different towns. In particular, the constancy of the percentage of protein eaten was remarkable, 11.03 per cent in St. Andrews, 10.16 in Cardiff, and 10.32 in Reading. These figures were the more interesting when it was seen how widely

different were the types of foodstuffs eaten by these communities of people. For instance, comparing groups of people of the same monetary standing, whereas 78 per cent of the St. Andrews group of families ate sausages, only 38 per cent of the Cardiff families ate them. In Cardiff 94 per cent of the families ate butter, as compared with 61 per cent in Reading and 33 per cent in Glasgow.

It is indeed clear from these reports that the constant percentage intake of the energy-bearing constituents, shown by people living far apart, is obtained independently of the type of foodstuff eaten, and it would seem to represent the result of some kind of instinct.

**ANATOMY AND PHYSIOLOGY, AND CAUSES OF DISEASE.**—By John P. Mitchell, O.B.E., M.D. 1937. Baillière, Tindall and Cox, London. Pp. xvi plus 215, with 87 figures. Price, 2s. 6d.

and  
**NURSING.**—By R. A. Bagot, M.B.E. 1937. Baillière, Tindall and Cox, London. Pp. xii plus 183, with 136 figures. Price, 2s. 6d.

THESE two small handbooks are written for the instruction of African nurses, dispensers and health orderlies, whose limited education and knowledge of English preclude them from reading the usual English textbooks. They provide an elementary knowledge of the subject from a beginner's point of view. The style is simple and the technical expressions have been explained as far as possible. There are a number of good illustrations to make the scientific aspect of the subject more comprehensible.

The extreme simplification which has been attempted has resulted, sometimes, in inaccuracy or incompleteness. For instance, pellagra has been attributed to deficiency of vitamin A, while the rôle of the calcium salt in the coagulation of the blood has not been mentioned.

The volume on nursing is eminently a practical one which would serve as a reliable guide to probationers in the ward. There are a few minor errors which will undoubtedly be corrected in later editions.

The booklets are likely to be useful to the nurses, midwives, and health visitors in this country.

R. C.

**SYDNEY HOSPITAL PHARMACOPŒIA AND REFERENCE HANDBOOK.** Ninth Edition. 1937. Angus and Robertson Limited, Sydney. Pp. ix plus 104. Price, 4s. 6d.

THIS is a useful pharmacopœia but there is little to distinguish it from those issued by many other hospitals. In addition to the usual prescriptions which necessarily show little variation from one pharmacopœia to another there are numerous appendices on various special branches of treatment, these include among other things lists of food values for ordinary articles of diet, treatment of poisoning by the common poisons, snake bite and several other useful items of information.

There is nothing to recommend this small book to the tropical practitioner for there is no section devoted to the special forms of treatment employed in tropical conditions. The price is also somewhat higher than many will be prepared to pay.

**LATENT SYPHILIS AND THE AUTONOMIC NERVOUS SYSTEM.**—By G. Evans, M.A., D.M. (Oxon.), F.R.C.S., D.O.M.S. Second Edition. 1937. John Wright and Sons, Limited, London. Pp. x plus 158, with 50 illustrations. Price, 7s. 6d.

THIS is a small handbook in which the author has tried to associate latent syphilis with many ill-defined and little-understood pathological processes in the human body which are often the causes of untold miseries of men and women. The diagnoses of such conditions are missed by the average medical man who is more often guided by the orthodox methods for the laboratory diagnosis of syphilis than by the actual clinical data. The author is of opinion that goitre, allergic conditions, asthma, large numbers of vasomotor

disturbances, viz, angio-neurotic oedema, purpura, claudication, etc., nervous dysphagia and a motley group of symptoms which may be included under the term nervous dyspepsia, or 'chronic abdomen', may be the results of latent syphilitic infection in a considerable proportion of cases.

He bases his opinion on the fact that the organisms of syphilis produce primarily a pathological change in the lymphatic system which subsequently leads to alteration in the autonomic nervous system. He is a strong believer in the 'granular stage' in the life cycle of *Treponema pallidum*, which is therefore not demonstrable in the lesions. In many such cases the Wassermann test is found to be negative. He asserts that the only proof of it is that the cases respond well to measures.

The average general practitioner will derive a good deal of wisdom on reading through the pages of this book. The author's trenchant remark on blindly depending on a positive Wassermann reaction for the diagnosis and treatment of suspected cases of syphilis should be noted by everybody. Rightly has the author said 'it is not too much to say the Wassermann test has become master instead of servant'.

Although the subject matter of this book is mainly composed of rather philosophical discussions on highly controversial matters and is to some extent revolutionary and contrary to the usual teaching, yet there is much food for thought for those who are interested in syphilology. For instance, the involvement of nerve fibres by enlarged and chronically-inflamed lymph nodes in the thorax and abdomen will explain many a vague and unexplained symptom and a proper appreciation of such an underlying pathology will no doubt help to cure the sufferers. The affection of the adrenal glands in syphilis and compensatory hyperplasia of the thyroid gland leading to the production of goitre is certainly an interesting idea. The chapters on 'certain types of tongue and their relation to syphilis' and 'cancer and syphilis' are also interesting to read.

The book however conveys a general feeling that the writer has dogmatically carried some of his ideas too far. After going through its pages, one may be unconsciously scared that he is himself suffering from one or other of the manifestations of latent syphilis! It would be difficult for anybody to believe that the chronic peritoneal adhesions in the abdomen are the results of syphilis. Had the author published his book a few years earlier, both Jackson and Lane would have breathed a sigh of relief at the solution of the problems of these peritoneal bands. Few orthopaedic surgeons would like the idea that syphilis may be diagnosed from *pes cavus*. Pathologists will certainly not agree with the writer that syphilitic lymphadenitis is the cause of aortitis and aneurysms, nor that carcinoma is the common termination of syphilis. The writer's ideas about the physiological changes in the thyroid gland will be accepted by the histologists with a grain of salt. Although some of the plates are very well executed, the histological pictures at the end of the book hardly carry any conviction.

M. N. D.

#### SYNOPSIS OF OBSTETRICS AND GYNÆCOLOGY.—

By A. W. Bourne, M.A., M.B., B.Ch. (Camb.), F.R.C.S. (Eng.), F.C.O.G. Seventh Edition. 1937. John Wright and Sons, Limited, Bristol. Pp. vii plus 452. Illustrated with numerous diagrams. Price, 15s.

MEDICAL publishers of to-day provide the 'overburdened' student and the 'busy' practitioner with many 'series', but there is probably no more useful or popular one than Wright's 'synopsis' series. The book under review is an excellent example of this series.

It is now in its seventh edition and it is only two years ago that the last edition was published. There have been no startling changes in either obstetric or gynaecological practice during the last two years and it is clear that the printing of a new edition was mainly

necessitated by the exhaustion of the previous one, a circumstance which indicates the book's popularity.

However, a few changes have been made, both in the form of omissions and of additions; amongst the latter are references to the value of mandelic acid in *Bacillus coli* infections and of the sulphanilamide compounds in puerperal sepsis.

The book is written by a practising gynaecologist on the staff of one of the large London hospitals, who is also a teacher of high repute; the book is therefore practical and suitably arranged for the student.

The practitioner will find it invaluable for ready reference, to refresh his memory or to indicate where present-day teaching differs from that of his student days.

**AIDS TO PHYSIOLOGY.**—By Henry Dryerre, Ph.D., M.R.C.S., L.R.C.P. (Lond.), F.R.S.E. Second Edition. 1937. Baillière, Tindall and Cox, London. Pp. vii plus 295, with 63 figures. Price, 3s. 6d.

This is a good example of this deservedly popular 'aids' series. The rapid advances in this subject have made another edition necessary. The author has provided a good résumé of the subject. We can recommend it to students for rapid revision of the subject just before their examination.

**COMMON SKIN DISEASES.**—By A. C. Roxburgh, M.A., M.D., B.Ch. (Cantab.), F.R.C.P. (Lond.). Fourth Edition. 1937. H. K. Lewis and Company, Limited, London. Pp. xxxi plus 401, with 8 plates in colour and 165 illustrations in the text. Price, 15s.

THE fourth edition of this book has appeared only five years and three months since its first appearance, evidence that it is maintaining its early popularity. There is little change in this edition except in detail and in alteration and additions to the illustrations and a short section on intra-epidermal epithelioma has been added. It may still be recommended as one of the best books in the English language on dermatology for the general practitioner.

P. A. M.

**ENDOCRINOLOGY, CLINICAL APPLICATION AND TREATMENT.**—By August A. Werner, M.D., F.A.C.P. 1937. Henry Kimpton, London. Pp. 672 with 265 illustrations all in black and white. Price, 40s.

In this excellent volume the author has attempted to give to the medical and allied professions such knowledge as we have at the present time on the physiology and pathology of the various endocrine glands, to depict the physical types resulting from their disorder and present this information in a form useful for the diagnosis and treatment of human cases. For obvious reasons such a task is an extremely difficult one to perform and yet the author has done this very successfully. This has been possible only because of his life-long personal interest in this abstruse subject.

The author has, we think, rightly commenced his work with a detailed and comprehensive description of the anatomy and physiology of the autonomic nervous system as well as its intimate relationships with the glands of internal secretion. The division of the system into sympathetic and parasympathetic, with diametrically opposite effects when stimulated, has been

This is immediately followed by a general consideration of the ductless glands and study of their function is effected, sometimes very profusely, of such glands. The next eight chapters are devoted to the consideration of the anatomy, histological structure, physiology and a complete and up-to-date account of the progress made in connection with the hormones secreted by each endocrine gland. The changes produced in the body by a pathological alteration of these hormones have been described and the various bodily alterations profusely illustrated by excellent pictures taken from

actual cases. A very prominent feature of these chapters is the inclusion in the text of a large number of actual case records, their investigation and treatment, ending with a general discussion. This undoubtedly detracts from boring monotony of following up the multifarious and often confusing views expressed by different workers on endocrine problems and maintains the reader's interest in the more practical side of the question. Another noteworthy point is the up-to-date information on treatment of endocrine conditions at the end of each section, with a clear but bold statement on the usefulness or otherwise of the various preparations recommended for use at the present time. A few chapters towards the end are devoted to the study of obesity, diseases of the bones, skin and hair, particularly from the point of view of disorders of the endocrine glands. The discussion on obesity is specially commended for its comprehensiveness and for the rational line of treatment suggested. The author has put in a chapter on the teeth and has discussed the influence of the various disorders of the ductless glands on them, with numerous illustrations. This chapter will be read by everybody with considerable interest. He closes his book by devoting one chapter to the description of the methods of diagnosis of endocrine conditions. Although this comprises only five pages, every line in it is important and if these methods are followed by every practitioner, a great deal of confusion and difficulty will be removed, during the routine diagnosis, of the nature of endocrine disorders. A complete but useful bibliography is appended at the bottom of the page in which references have been made to them, thus saving the trouble of searching for them at the end of a chapter. The paper and printing are very good and the diagrams and photographs excellently reproduced. The publishers are to be congratulated for the excellent execution of the book as a whole.

It is indeed hard to criticize the work of a man such as Professor Werner who has spent over 25 years of his life to the study of this special subject. While going through the pages of the book, however, certain points have been noted on which the reviewer feels called upon to make a few criticisms. In connection with the theory of the menstrual cycle, the author has only discussed the usually accepted ideas. A sufficiently large amount of experimental and clinical data have, however, accumulated to cast some doubt on whether the anterior pituitary is to be considered as the prime controller of the menstrual cycle. The reviewer takes strong exception to the use of the words 'Benign metastatic tumours of the thyroid' on page 421. This

is undoubtedly a very loose expression which should not have received encouragement from the writer. Contrary to whatever may be found in older literature, we should now look upon such tumours only as metastatic deposits of a primary carcinoma of the thyroid. The photomicrographs are very poor. In a book of such quality, their replacement by better and more illustrative histological pictures should engage the serious attention of the writer. The section on 'configuration of the hands as an aid to endocrine diagnosis' is too interesting to be discussed as a subheading under the pituitary gland and the reviewer feels strongly that it should have a proper place in a separate chapter, like obesity.

In conclusion, we strongly recommend this volume to every practitioner for ready reference in his daily practice. Such a book would surely be an important addition to every medical library in the world.

M. N. D.

**PHYSICIANS AND MEDICAL CARE.**—By E. Lucile Brown. 1937. Russell Sage Foundation, New York. Pp. 202. Price, 75c.

This is an account of the development of medical education in the United States of America, and as such is of little interest outside that country except perhaps to those specially interested in medical education.

#### OTHER BOOKS RECEIVED

**Book of Health: A Birthday Souvenir of H. H. The Maharaja of Travancore.** Edited by Dr. R. K. Pillai, D.D.S., F.P.C. (Lond.). Published by Messrs. Thacker and Company, Limited, Bombay. Pp. xi plus 194. Price (not stated).

**What is Osteopathy?** By C. Hill, M.A., M.D., D.P.H., and H. A. Clegg, M.A., M.B., M.R.C.P. 1937. Published by J. M. Dent and Sons, Limited (Aldine House, Bedford Street), London. Pp. xix plus 217. Illustrated. Price, 7s. 6d.

**Sexual Power.** By C. T. Stone, M.D. 1937. Published by D. Appleton-Century Company, Incorporated (34, Bedford Street, Strand, W.C.2.), London. Pp. ix plus 172. Illustrated. Price, 6s.

**Research on the Low Potencies of Homœopathy.** (An Account of Some Physical Properties indicating Activity.) By W. E. Boyd, M.A., M.D. (Glas. Univ.). 1936. Published by William Heinemann (Medical Books), Limited (99, Great Russell Street, W.C.1.), London. Pp. 38. Illustrated. Price, 2s. 6d.

## Abstracts from Reports

### REPORT ON THE HEALTH OF THE ARMY FOR THE YEAR 1935

The general health of the soldier has continued to be very satisfactory throughout the year under review, and there was a still further improvement in the incidence of sickness.

The ratio of admissions to hospital was 392.1 per 1,000 of the strength, or 10.5 per 1,000 lower than in 1934, which previously was the healthiest year since the Great War.

The death and invaliding ratios also show slight reductions, but there was a very small increase—0.29 per 1,000—in the numbers constantly sick.

In India there was a gratifying reduction of 7.0 per 1,000 in the total admission rate, and 148 fewer invalids were sent home from that country during the year.

#### NOTES ON DISEASES

**Cerebro-spinal meningitis.**—There has been a further decrease among Indian ranks, both in the number of cases and in the case mortality. Of the total of 41 cases,

21 occurred in the Northern, 10 in the Eastern, 7 in the Southern, and 3 in the Western Command. The majority of cases occurred in the first three months of the year. Triple concentrated serum was used, as in 1934, and the average amount injected in each case was 105 c.cm. intrathecally and 50 c.cm. intravenously or intramuscularly. In three cases iodine was given intravenously as well as serum; all recovered. In two other cases trypanflavine was given intravenously in addition to serum; one case recovered and the other died.

**Cysticercosis.**—Five cases were diagnosed during the year. Of these four were invalided. In spite of all precautions, there were 24 cases of infestation with *T. solium* during the year, the same number as in 1934.

Thirteen cases of epilepsy were invalided during the year, but in none of these was there evidence of cysticercosis.

**Dracontiasis.**—There were nine admissions during the year.

**Dengue.**—The incidence of this disease in 1935 is the lowest in 11 years. The great majority of the cases did not show the typical signs or symptoms.

*Sandfly fever.*—Research into the epidemiology of sandfly fever was continued at Peshawar. Further attempts to infect mice with material from human cases and produce a fixed virus were, however, uniformly unsuccessful.

As in the case of dengue, the correctness of the diagnosis, except possibly in the northern areas, is frequently a matter of uncertainty. Until some preventive method against this disease can be discovered, the policy of replacing and repairing unsuitable buildings is being continued.

*Fevers of the typhus group.*—Eighty-two cases occurred among British and Indian troops, but only 19 were among British troops, compared with 52 in 1934.

The results of agglutination tests against standardized 'O' suspensions of *B. proteus* XK, X2, and X19, as in 1934, fall into three serological groups corresponding to each of the above antigens (XK = 18 cases, X2 = 14 cases, X19 = 43 cases). Seven cases could not be grouped owing to a general rise, or too small a rise in titre or insufficient tests. Forty-five cases occurred in the Southern, 20 in the Northern, 5 (X19) in the Western, and 8 in the Eastern Command, and 4 (XK) in Burma. The seasonal incidence in all groups was mainly in the post-monsoon and cooler months.

The symptoms in each group varied from very severe to very mild. On the whole the 18 cases of the XK group were the most severe. The greater proportion suffered from nervous symptoms, *e.g.*, lassitude, drowsiness, indifference to surroundings, etc. On the other hand, four cases (22 per cent) complained of pyrexia of very moderate degree and duration and slight initial headache only. Throat symptoms were a marked feature in several cases. Rash (erythema, or erythema us macules) was present in 22 per cent only, and in cases was restricted to the trunk.

Six cases occurred in the early autumn in the Simla Hills, as part of a small epidemic, which included some civil as well as military cases. This period corresponds with the height of the 'flea season' and a strain of *Rickettsia* from fleas caught in this area was discovered and passed, but proved to be in antigenic structure OX19. Co-agglutinins to OX19 and OX2 were mainly absent, or present only in low titres. In three cases, 10 per cent (1 OX2, 1 OX19, 1 OX2, and OX19), co-agglutinins were present in appreciable titres.

Cases of the OX2 serological group occurred mainly in the Southern but also in the Northern and Eastern Command, the seasonal distribution being very similar to that of the OXK group. The symptoms in this group were similar, and come next in order of severity to the OXK cases, mental disturbance, drowsiness, etc., being, however, less frequent in the latter than in the former. In six cases (42 per cent), no symptoms were present except headache and moderate pyrexia.

A maculo papular rash involving the extremities as well as the trunk was present in 85.7 per cent of the cases, and in the majority (contrary to the other two groups) there was a history of association with camps, flag marches, training, etc., but, as was the case with the other groups, no history of tick or other insect bites.

Co-agglutinins to OX19, OXK, or both occurred in practically all cases, but insufficiently so in the vast majority to create any doubt as to the correctness of the grouping on serological grounds.

As in 1934, cases of the OX19 serological group occurred to a large extent (50 per cent) in the Southern Command. Twelve cases were discovered in the Northern Command (seven of these were from Rawalpindi), four in the Western and three in the Eastern Command. The seasonal distribution was similar to those of the other groups. The symptoms were definitely milder than in either the OXK, or the OX2 group, and were, on the whole, more severe among the few British cases. In only a few cases were nervous symptoms such as drowsiness, lassitude, etc., mentioned. Complications such as broncho-pneumonia did occur, and one case developed acute nephritis. Rashes variously described as erythema, subcuticular mottling, maculo roseolar in two cases pigmented in the later

stages were seen in 70 per cent of the British cases, but in only 18 per cent of the Indian. In the former, both trunk and extremities were involved. In the latter, rash on the trunk only was noted. It is probable that the dark skin of the Indian troops rendered the record of a mild rash of doubtful accuracy, in that it may depend to a considerable extent on the interest taken in its discovery. One case (British) is interesting in that the symptoms occurred five days after landing in India from the United Kingdom. In 72 per cent symptoms other than headache and pyrexia of moderate duration were absent.

Co-agglutinins to OXK and OX2 were present in the great majority of cases but, on the whole, the serological results were clear cut, and very high titres were reached in some of the cases.

As in 1934, a marked rise in agglutinins to the enteric group H agglutinins was found to occur. This was most marked in the OXK group, but nearly 30 per cent of the total cases in the three groups would have been included among the enteric group of fevers had not tests been simultaneously carried out against the *proteus* group. T. O. agglutinins, although not affected to the same extent, showed a definite rise in a certain number of cases, approximately 7 to 10 per cent.

*Pyrexia of uncertain origin.*—The steady decrease in the last three years of cases classified under this heading has been maintained. Many of the cases diagnosed as sandfly fever and dengue, especially in stations where these diseases are not endemic, might more correctly be classified as pyrexia of uncertain origin.

*Diphtheria.*—There was an outbreak of cutaneous and faucial diphtheria in a battalion engaged in operations on the N. W. Frontier in the autumn of 1935.

Diphtheria antitoxin was injected intramuscularly and also applied locally as a dressing. The initial intramuscular injection was 8,000 to 16,000 units and the average amount injected in each case was 30,000 units. In most cases the ulcers were healing by the fourth day and diphtheria bacilli could no longer be obtained. In some cases, however, *C. diphtheria* persisted for a long time in spite of a healthy granulating surface and prolonged serum treatment. In these cases the best results were obtained by applying mucidan as a dressing.

*Enteric group of fevers.*—The incidence among British troops increased slightly (0.3 per 1,000) as compared with 1934. Fall in the incidence among British since 1932 has continued.

In 1935 there were nine deaths among the British and 13 among Indian cases. A striking feature of these cases is that in 19 of them death occurred before the end of the second week, suggesting either an overwhelming infection or an ambulant type of the disease. Perforation of the intestine occurred in three cases; hæmorrhage in two cases; seven cases died of intense toxæmia. The remaining deaths were due to lung complications. The great majority, particularly among Indian troops, had been repeatedly inoculated during their service. One case who had been inoculated on seven occasions died of a perforation on the eleventh day.

In the report of 1934, attention was drawn to the unsatisfactory results obtained with T. O. alcoholized suspensions in cases of the enteric group. A detailed analysis of the results of as many cases as possible has been carried out.

Brief conclusions are that—

1. There is no real base-line of T. O. agglutination titre in an inoculated individual above which enteric infection could be diagnosed by a single test.
2. At least 30 per cent of typhoid cases produced no evidence of T. O. agglutinins by the second week, and in only 44 per cent did the titre rise to over 1/50.
3. In a small group of 24 cases who died of typhoid fever it is seen that T. O. agglutinins were present in a much higher percentage and to higher titres than in the ordinary type of case.
4. The typhus group of fevers appears to have a certain stimulating effect on the T. O. inoculation agglutinins as well as on the 'H' inoculation agglutinins as



shown by the small percentage (56.5) with nil agglutinins as compared with the 9.7 per cent present in group (1).

*Dysentery, diarrhoea and colitis.*—During 1935 the admission ratio for dysentery increased by 3.7 per 1,000; that for diarrhoea decreased by 1.0 per 1,000, and for colitis by 0.4 per 1,000.

Dysentery cases were, as usual, sporadic in occurrence, the main incidence corresponding with the fly season. There were no epidemics, although a small outbreak (16 cases) occurred in the 2nd Battalion The Royal Scots in Lahore. This was found to be caused by *B. dysenteriae* Sonne, which appears to be a comparatively common cause of dysentery in the spring months of the year in that area, being replaced by the Flexner group in warmer months. A small outbreak among the Indian platoon attached to the 20th Rifles in Burma is of interest in that one of the newly discovered strains of dysentery bacilli (known in India at the moment as P. 288) was isolated in practically pure culture from every case.

The scheme for the investigation of the mannite fermenting group of bacilli hitherto unclassified was continued throughout the year. The conclusions arrived at are briefly as follows:—

1. Dysentery group bacilli isolated in Bangalore and Poona of types not described in 'A System of Bacteriology 1929' have proved to be widely distributed throughout India.

2. Using a system of classification in which these strains are included, it is now possible to identify practically all dysentery group bacilli found in India.

3. The evidence as a whole is strongly in favour of the belief that the majority of these 'new' strains (three of which have been found in other countries) are capable of causing dysentery.

*Tropical abscess of the liver and hepatitis.*—There were 56 admissions for hepatitis, of which 24 were considered to be definitely amoebic in origin, and in 10 the aetiology was doubtful. Three of the former group had two admissions to hospital. As in 1934, there were three cases of tropical abscess—all recovered. One death from multiple liver abscesses occurred during the year, but they were pyæmic in origin and followed on the rupture of a gangrenous appendix.

*Malaria.*—Incidence was 11.4 per 1,000 lower than that in 1934, which was up to that date the record year. The position is even more satisfactory than at first appears, when it is taken into account that frontier operations in a notoriously unhealthy area and during the malaria season were undertaken.

Treatment has been carried out mainly with atebirin followed by a course of plasmoquine or quinine and plasmoquine concurrently for 21 days. One thousand three hundred and eighty-one were treated with atebirin and plasmoquine, and 1,060 by quinine and plasmoquine. From an administrative point of view the former seems preferable as the length of time off duty is shorter. There is a fairly universal consensus of opinion that atebirin does not always reduce the temperature promptly or prevent a further rise in temperature in benign tertian cases after 48 hours from the commencement of treatment. It is recommended therefore that treatment for the first 48 hours should be by quinine (grs. xx per diem) followed by a seven days' course of atebirin (0.3 grm. per diem), a three-day interval and finally a five days' course of plasmoquine (0.03 grm. daily).

There is one outstanding fact however, viz., that since the almost universal use of plasmoquine in the Army in India, the chronic relapsing cases of benign tertian malaria, which used to be gathered together in the Malaria Treatment Centre, Kasauli, no longer exist in any appreciable number, if at all. Trials with atebirin musonate were carried out in the Southern and Northern Command. Among both groups of cases, however, medical opinion was definite that pyrexia was quickly controlled by injections with this drug.

*Veneral diseases.*—The incidence has increased during the last two years. The percentage of relapse cases of gonorrhoea was 23.2 and the average number of days in

hospital for this disease was 47.22. Routine treatment was by lavage with alkaline potassium permanganate. The use of gonococcus exotoxin was found to reduce somewhat the length of time in hospital; in obstinate cases which did not respond to exotoxin a polyvalent gonococcus vaccine gave beneficial results. Syphilis has been treated with both sulphostab and metarsenobillon. Several cases of severe reactions to the latter have occurred. Dmelcos vaccine has been found to be very satisfactory in the treatment of soft chancre, and appears to reduce the incidence of adenitis in these infections.

*Smallpox.*—In spite of the high state of protection, there were eight cases of smallpox during the year.

*Tuberculosis.*—There were 54 (1.0 per 1,000) admissions for pulmonary tuberculosis with 3 (0.06 per 1,000) deaths in India, and 35 (0.66 per 1,000) were sent home as invalids. Tuberculosis of other organs accounted for 15 admissions and nine were sent home as invalids.

*Diseases of the respiratory system.*—Excluding pulmonary tuberculosis, there were 1,217 admissions for respiratory diseases, giving a ratio of 23.1 per 1,000 or 1.3 more than in 1934. There were 164 cases of lobar pneumonia with 19 deaths and a case mortality of 11.6 per cent. Out of 58 cases of broncho-pneumonia two died giving a case mortality of 3.4 per cent. Bronchitis accounted for 757 admissions and pleurisy 93.

*Diseases of the digestive system.*—There were 5,014 admissions as compared with 5,582 in 1934, a decrease of 568 cases.

*Diseases of the areolar tissue and local injuries.*—Although there has been a slight reduction in the incidence of diseases of the areolar tissue, these still rank second only to malaria in the production of inefficiency through sickness. The admissions included 2,301 for cellulitis and 473 for boils giving ratios per 1,000 of 43.7 and 9.0 respectively.

*Effects of heat.*—Out of the total of 90 cases, 78 were heat exhaustion, 11 heat-stroke and one was sun-stroke. There were eight deaths compared with nine in 1934.

*Surgery.*—Three thousand one hundred and twenty-seven surgical operations were performed during the year, with 34 deaths—a case mortality of 1.08 per cent. The operations included 419 for appendicitis with six deaths or a case mortality of 1.4 per cent.

Following the Quetta earthquake, it was found that the use of plaster of paris casts in practically all cases of fracture facilitated their transport and was far superior to the usual splint method in safety, ease of handling and comfort of the patient.

#### THE NOWROSJEE WADIA MATERNITY HOSPITAL, BOMBAY. FOURTEENTH ANNUAL REPORT FOR 1936

THE total number of admissions in the hospital was 6,369 against 6,144 in 1935. The total number of confinements was 4,728 against 4,654 in the year 1935. The number of millhands was 3,103 against 3,211 last year. This works out at a percentage of 65.6 of the confinements. The average number of beds occupied was 117.6 against 120.6 in 1935.

##### BABIES

Live-births (including 46 twins and two triplets)	..	4,019
Stillbirths and macerated	..	1,317
Died during the first ten days	..	482

*Students.*—During the year under report 52 final year students from the Seth Gordhandas Sunderdas Medical College conducted 1,040 cases, while 94 final year students from the Grant Medical College conducted 1,069 cases. In addition to this 22 students from the Medical School, Hyderabad, Sind, conducted 132 cases.

A fresh batch of demonstrators was appointed. They guide the students in conducting delivery and practising abdominal palpation; after confinement they give demonstrations on abnormal cases that have delivered and also on cases having had artificial interference. This stimulates practical work amongst students.

**Post-graduate training.**—Seven post-graduate students availed themselves of the facilities of post-graduate work and practical training in obstetrics for a period ranging from three to six months.

**Nursing staff.**—Thirty-four probationer nurses were admitted for training against 49 in the year 1935 of whom 22 were stipendiary and 12 were paying. Twenty-six nurses were sent up for the Bombay Nursing Council examination out of whom 21 passed.

**Interim report of the present-day nutrition of expectant mothers in the poor classes.**—In view of the prevalence of anemia among expectant mothers and women in general, an enquiry has been instituted in order to obtain data regarding the quality and quantity of food taken by expectant mothers who visit the antenatal clinics at the Nowrosjee Wadia Maternity Hospital and the Bombay Presidency Infant Welfare Society's Centres.

The enquiry was commenced in June 1936, and so far data of 600 families have been obtained. Considering the difficult nature of the enquiry and the intricacy of calculations the enquiry is likely to occupy another year.

The result so far shows that the diet is poor both in quantity and quality. Ignorance as regards proper diet, the difficulty of obtaining it at proper times, and absence of variety appear to be contributory causes of malnutrition. Absence of proper milk supply to the family leads to prolonged lactation and diminishing vitality of the mother.

#### REPORT ON THE SESSION OF THE PERMANENT COMMITTEE OF THE OFFICE INTERNATIONAL D'HYGIENE PUBLIQUE HELD IN PARIS FROM 4TH TO 13TH MAY, 1936. BY COLONEL A. J. H. RUSSELL, C.B.E., K.H.S., I.M.S., DELEGATE FOR INDIA

**Pilgrimage.**—Dr. Gilmour's report showed that this year's pilgrimage had been healthy, the only new point being that, for the first time in history of the pilgrimage, certain pilgrims from Egypt travelled to the Hedjaz by air. On return they landed at El Tor and underwent the usual five days' quarantine.

**Psittacosis.**—Dr. Cumpston's paper on Psittacosis in Australia was taken up. The occurrence of cases in Australia (the first recorded) showed definitely that the virus was pathogenic to men. Reference was made to an outbreak of human psittacosis in Vienna and certain cases among birds in Holland. Dr. Madsen referred to certain strict regulations in a number of countries which had led to the smuggling of birds.

**Cholera.**—I presented Colonel Taylor's note on researches in India (appendix 29) and also Dr. Linton's reprint. There was no discussion on cholera but the President thanked me for these communications.

**Plague.**—A number of papers were presented including Colonel Sokhey's note on 'A new anti-Plague Serum' which I briefly introduced.

Dr. de Vogel's paper (appendix 36) dealing with the temperature and humidity conditions through which ships have to pass conveying cargo from India (Calcutta) to Peru was a very laborious piece of research. The conclusions he reached after minute analysis of the figures were entirely against the Peruvian thesis that the infected plague fleas could have been carried in jute bags and he found that the outbreak of plague must have originated in Peru itself. Quite apart from the fact that infected fleas could not have been taken on board at Calcutta in the jute bags, Dr. de Vogel's research finally disposed of this question and we are not likely to hear any more about it.

**Diphtheria.**—I presented the note sent from India. The U. S. A. delegates said that although diphtheria was not a frequent disease in America, it was 'the subject of energetic preventive measures. Ramon's anatoxin was used, two injections only and not three as in France; also a newly developed 'alumi-precipitated

toxoid of which one dose was given—thanks to this, and to educative measures, the morbidity and mortality were both diminishing. Dr. Madsen referred to the immunization schemes in Denmark. One fairly large dose of a purified anatoxin was given; this was followed four weeks later by an instillation of two to three drops of the anatoxin into the nose. This method had the advantage of only one injection and at the same time produced a high immunity. The first injection was essential in order to produce a basic immunity which could then be built up by the instillations. The instillations produced no immunity without the preliminary immunization by injection.

INFORMATION ON YELLOW FEVER RECEIVED DURING THE SIX MONTHS ENDING 31ST MARCH, 1936. BY S. P. JAMES

**Epidemiological varieties of yellow fever.**—Among recent additions to knowledge of yellow fever by far the most important is the discovery that much of the yellow fever that is present in the world exists endemically in the absence of *Stegomyia fasciata* (*Aedes aegypti*) and that some of it exists endemically in the absence of human beings. The situation disclosed by the discovery is disquieting but not altogether unexpected. In several previous summaries mention was made of observations which seemed to indicate that sooner or later it would be necessary to revise and supplement the classical epidemiological account which described human beings as being the only source and reservoir of the yellow fever virus *Aedes aegypti* as being the only insect vector. That account is still correct for the variety of yellow fever with which it dealt (the variety that is now called 'Urban Yellow Fever') but it is insufficient for two other varieties which have been found during the last three years to be widely distributed in South America. Both these varieties exist endemically in the complete absence of *Aedes aegypti*. One of them which is called 'Rural Yellow Fever' without *Aedes aegypti* occurs in strictly rural areas in which the human population is sufficiently numerous and sufficiently aggregated to justify the view that the cycle of infection is from man to vector and from vector to man; the other, which is called 'Jungle Yellow Fever', occurs in areas of uncleared jungle and forest, or on land that is being cleared for agriculture, or along the banks of rivers, in places which are not and never have been inhabited by man or in which the number of human inhabitants is so small and so scattered as to rule out the view that they could be the source and reservoir of infection.

**Epidemiology.**—The epidemiological picture of jungle yellow fever is quite different from that of yellow fever transmitted by *Aedes aegypti*. The latter is a 'house or family disease' to which all non-immunes who live in or visit an infected house are equally liable. Jungle yellow fever, on the other hand, is not contracted in houses, it is contracted in forest or jungle or in fields situated close to uncleared areas and only those members of a family who work in or visit these places become infected.

Observations seem to leave little room for doubt that human beings are not essential to the continuance of endemicity nor to the spread of the disease from one place to another. If this is so it would seem that jungle yellow fever in man must be regarded as an accidental happening in the course of an epizootic among the lower animals. This view receives support from observations proving that monkeys of three different species caught in widely separated endemic areas in South America possessed an acquired immunity to infection.

About the insect vector of this variety of yellow fever several species of mosquitoes other than *Aedes aegypti* (which was never found) were abundant in the jungle areas in which the outbreak cited above was observed. Particularly several species of the widely distributed genus *Hæmagogus*, including 'the blue mosquito' *Hæmagogus equinus* which was observed to attack human beings viciously in those areas. It was proved in the laboratory that the virus of yellow fever can be transmitted from monkey to monkey by mosquitoes of this genus.



**Ætiology and pathology.**—The virus has been isolated from human cases of jungle yellow fever in Brazil and is being maintained and studied in monkeys and mice. It seems to be identical with the virus isolated from cases of urban yellow fever and, like that virus, it is transmissible from monkey to monkey by the mosquito *Aedes ægypti* as well as by other species. Clinically and pathologically, also, no difference between jungle yellow fever and the urban variety has been observed and the results obtained by the application of the mouse protection test in persons who have recovered from the disease and by histological examination of specimens of liver tissue from fatal cases are identical.

It is thought that further study of 'rural yellow fever without *Aedes ægypti*' may show that its epidemiology is the same as that of 'jungle yellow fever' for up to the present all observations of yellow fever without *Aedes ægypti* have been made in places where clearing of the land of forest and jungle has not been complete.

**Clinical varieties of yellow fever.**—In countries where yellow fever exists the increased adoption of the practice of 'viscerotomy' (and in some instances of complete autopsy) has shown that in addition to mild varieties of the disease which cannot be diagnosed clinically there are fatal varieties in which the clinical symptoms during life give no reason for supposing that the disease is yellow fever. Among these an important variety recently found is one in which nervous symptoms and lesions predominate. A proved case of yellow fever in which hemiplegia and other nervous symptoms developed during the attack was reported by Stefanopoulo and Mollaret in 1934. More recently in Africa several cases with involvement of the central nervous system have been recorded.

**The mouse protection test.**—What was said concerning the usual age-incidence of 'jungle yellow fever' has a bearing on the interpretation of results obtained in immunity surveys by the application of the mouse-protection test. Evidently it is not always correct to assume that localities in which the youngest donors of protective serum are of adult age are localities in which yellow fever does not exist at the time of examination and has not existed within recent years.

It is important also that, in countries where jungle yellow fever exists, absence of evidence of immunity among the inhabitants of towns and ports can no longer be regarded as indicating that the district in which they are situated is free from infection. The protection test survey of towns in Matto Grosso gave no evidence of previous yellow fever, for the percentage of positive results in 1,055 tests was only 1.6. But when the survey was extended to neighbouring rural areas positive results as high as 53 and 71 per cent were obtained.

**Results of mouse-protection test on monkeys.**—Dr. Soper reports that in South America of 93 monkeys which were shot or caught in endemic areas of yellow fever in Colombia, Matto Grosso, Goyaz and Minas Geraes for the purpose of determining naturally acquired immunity, 18 (about 20 per cent) gave a positive result with the mouse-protection test. Dr. Findlay and others report that in Africa of 25 monkeys three gave a positive result. Findlay has since reported that another *Colobus* monkey from the Gold Coast and a *Cercopithecus* from the Anglo-Egyptian Sudan were found to possess an acquired immunity.

**Vaccination against yellow fever.**—In London routine immunization against yellow fever by the inoculation of virus and immune serum has been continued by Dr. G. M. Findlay of the Wellcome Research Institute assisted by Dr. A. H. Mahaffy of the International Health Division of the Rockefeller Foundation. A total of 951 persons proceeding to or resident in British colonies in Africa has been immunized against the disease by inoculation with virus and immune serum. Vaccination also continues to play an important part in measures against yellow fever in French Colonies in Africa.

## KASHMIR MEDICAL MISSION OF THE CHURCH MISSIONARY SOCIETY REPORT FOR 1936

DURING the year 1936, 2,383 patients were admitted. Bone disease cases were many, and these patients occupy beds longer than any other kind of case. About 100 cataract operations were performed. Bears are still common in Kashmir and several bear-maul cases come for treatment every summer and autumn. Most of these cases make good recoveries.

Heart disease is very common amongst the Kashmiris and again this year there was a large number of both men and women suffering from this complaint.

A study of fifty years' records of surgery was made. The operation mortality, on 86,356 major operations, was only four-fifths per cent. On tumours (14,107) it was even less, viz, three-fifths per cent. One hundred and six very large intra-abdominal tumours were removed with a mortality of only seven, which contrasts favourably with the work of Spencer Wells and Thomas Keith, when it is remembered how very late some of these patients came with enormous tumours. Eight hundred and twenty-seven major amputations had a mortality of 8 per cent which is not high when the nature of the cases is known, for many were amputations through the thigh for advanced knee joint disease in feeble patients. The contrast with the old pre-Listerian mortality of 40 per cent is striking.

**Hospital finance.**—During the past three years, owing to want of due correlation between receipts and expenditure, in 1934, there was a deficit of Rs. 13,000 and, in 1935, a further deficit of Rs. 4,000. To meet this and provide funds for 1936 and 1937, no less than Rs. 24,560 were sold out from our reserve funds, entailing also a further loss of Rs. 1,200 per annum from cessation of interest. Moreover, the endowment fund has been unadvisedly encroached upon.

Strong measures are being taken to arrest this great excess in expenditure, much of which arose under circumstances which no longer exist. The authorities trust, however, that the friends and subscribers will do their utmost to help them.

**A Viceregal visit.**—On 29th October, the hospital was honoured by the visit of Their Excellencies the Viceroy and the Marchioness of Linlithgow who were accompanied by H. H. the Maharajah.

## REPORT OF THE MEDICAL OFFICER OF HEALTH, MUNICIPALITY OF COLOMBO, FOR THE YEAR 1935

THE outstanding event of the year was the severe epidemic of malaria that was carried over from 1934 and continued until about the end of April, 1935, causing widespread distress, loss of many lives, and much financial loss over an extensive area of the island. Colombo, fortunately, escaped lightly. Apart from this abnormal occurrence the year under review was on the whole satisfactory from the point of view of the health of the city.

The corrected general death rate was 20.6 as against 21.3 in the previous year and 18.6 the lowest rate so far recorded in the year 1932. Mutwal, New Bazar, and Maradana wards, where sanitation and housing conditions are still bad, had a higher death rate than the other wards.

The corrected birth rate was 26.2 as against 25.4 per thousand in the previous year. Racially the Malays and Singhalese showed higher rates than the other races.

The stillbirth-rate was 65.8 per thousand live and stillbirths as against 64.6 for 1934. Its high incidence is a matter that requires investigation.

The corrected infant mortality rate was 160 per thousand births—the lowest so far recorded. Premature births and congenital debility accounted for 44.4 per cent of all the infant deaths. This is another matter that requires study.

The maternal mortality rate from all causes corrected for non-residents was 20.1 per thousand births as against 20.7 in 1934 and 19.1 the quinquennial average for 1930 to 1934. Compared with the rate in European

countries the rate is still very high and calls for further efforts for improving the maternity service in the city.

The principal causes of deaths in the city were pneumonia, the bowel diseases (diarrhoea, enteritis, and dysentery), and tuberculosis. Malaria caused 840 deaths in 1935 as against 185 in 1934, but of these deaths 411 or 48.9 per cent were of non-residents.

Enteric fever showed an improvement, there being only 225 deaths as against 206, the lowest number recorded in 1927. Mutwal, New Bazar, and Maradana, the sanitary backward wards, had the largest number of cases.

Plague showed an increase. There were 57 human cases with 53 deaths as against 34 cases and 28 deaths in 1934 and the average of 42 in the quinquennium 1930 to 1934.

Smallpox introduced from India in 1934 gave rise to 16 cases in 1935 and cholera, also introduced from India to Pehiyagoda on the opposite bank of the Kelani river, led to the occurrence of six contact cases in Mutwal, of which five ended fatally.

The milk supply of the city is still unsatisfactory. More deterrent punishment is called for in the case of repeated offences. The present maximum of Rs. 50 is hardly deterrent.

A Food and Drugs Ordinance is long overdue to ensure to the people a pure and wholesome food supply. The sale of articles of food in unauthorized places should be firmly put down in the interest of the public health, and instead of big and expensive markets the erection in future of much smaller markets consisting of one meat, one fish, and one fruit and vegetable stall might be considered.

The establishment of a small Maternity Home of six beds at Rajamalwatta was a great step forward. It is a great boon to the poor residents of this ward and will in course of time justify the expenditure on it by rendering a better maternity service to the people and bringing down the present high maternal mortality rate.

## Service Notes

### APPOINTMENTS AND TRANSFERS

The undermentioned are appointed Honorary Physicians to the King:—

Colonel H. C. Buckley, 1st March, 1937, *vice* Major-General Sir Cuthbert Sprawson, K.L., C.R.E., retired.

Colonel D. C. V. Fitzgerald, M.C., 27th March, 1937, *vice* Major-General C. W. F. Melville, C.B., retired.

Lieutenant-Colonel D. H. Rai, M.C., appointed Inspector-General of Civil Hospitals, Central Provinces, dated 5th July, 1937.

Lieutenant-Colonel E. G. Kennedy appointed Deputy Director-General, I. M. S., dated 14th July, 1937 (afternoon).

The services of Lieutenant-Colonel A. H. Shaikh are replaced at the disposal of the United Provinces Government, dated 14th July, 1937 (afternoon).

Lieutenant-Colonel E. Cotter is appointed Deputy Public Health Commissioner with the Government of India, dated 17th July, 1937 (afternoon).

Lieutenant-Colonel P. F. Gow, on return from leave, is reappointed as Professor of Midwifery, Medical College, Calcutta, *vice* Lieutenant-Colonel H. E. Murray.

Lieutenant-Colonel H. E. Murray, Officiating Professor of Midwifery, Medical College, Calcutta, on relief, reverts to his substantive appointment as Surgeon-Superintendent, Presidency General Hospital, Calcutta, *vice* Major J. C. Drummond.

Lieutenant-Colonel W. J. Webster, officiate as Director, Central Kasauli, in addition to his own duties, dated 7th August, 1937, or the date on which Colonel J. Taylor avails himself of the leave.

Major B. P. Baliga handed over charge of his office as Superintendent of the Midnapore Central Jail to Captain F. H. A. L. Davidson, on the forenoon of 15th July, 1937.

Major J. C. Drummond, Officiating Surgeon-Superintendent, Presidency General Hospital, Calcutta, on relief, is reposted as Civil Surgeon, Darjeeling, *vice* Captain G. B. W. Fisher.

Captain B. N. Hazra handed over charge of his office as Superintendent of the Barisal Jail to Dr. B. C. Munshi in the forenoon of the 15th May, 1937.

Captain G. B. W. Fisher, Civil Surgeon, Darjeeling, on relief, is appointed to act as First Resident Medical Officer, Presidency General Hospital, Calcutta, *vice* Captain E. H. Lossing, granted leave, or until further orders.

Captain A. W. West, Officer on Special Duty in the Office of the Public Health Commissioner with the Government of India for six weeks, from 17th July, 1937.

Captain F. H. A. L. Davidson, Civil Surgeon, Midnapore, is appointed temporarily to act as Superintendent of the Midnapore Central Jail, with effect from the forenoon of the 15th July, 1937, in addition to his own duties, *vice* Major B. P. Baliga, transferred to the Dum Dum Central Jail.

His Excellency the Governor of Bengal has been pleased to appoint Captain Gerard Kelly, Officiating Professor of Medicine, Medical College, Calcutta, to be Honorary Physician to His Excellency, during the absence, on leave, of Lieutenant-Colonel E. H. Vere Hodge.

### LEAVE

Colonel J. Taylor, D.S.O., is granted leave on average pay for 2 months, with effect from 7th August, 1937, or date of availing.

Lieutenant-Colonel P. Banerjee, Officiating Superintendent, Campbell Medical School and Hospital, Calcutta, is granted leave on average pay in India for 3 months, and thereafter leave on average pay out of India, Ceylon or Nepal for 4 months and 8 days, with effect from the 1st March, 1937.

Lieutenant-Colonel J. J. Rooney, Agency Surgeon, is granted leave on average pay for 3 months, with effect from the 26th June, 1937 (forenoon).

Major T. H. Thomas, Officiating Professor of Medicine, Medical College, Calcutta, is granted leave for 6 months, with effect from the 2nd June, 1937.

Captain E. G. Montgomery, Civil Surgeon, Jalpaiguri, is granted leave on average pay for 2 months, with effect from the 30th July, 1937, or from any subsequent date on which he is relieved.

Captain E. H. Lossing, First Resident Medical Officer, Presidency General Hospital, Calcutta, is granted combined leave *ex-India* for 2 months and 23 days, with effect from the 9th August, 1937, or from the date of relief.

### PROMOTIONS

#### Lieutenant-Colonel to be Colonel

A. C. Munro. Dated 9th July, 1937, with seniority from 1st February, 1932.

The promotion of Lieutenant-Colonel R. C. Phelps to the rank of Major/Lieutenant-Colonel is antedated to 28th April, 1927/28th April, 1935.

#### Captains to be Majors

T. A. Malone. Dated 2nd September, 1936.

W. T. Taylor. Dated 11th March, 1937.

#### Lieutenants (on probation) to be Captains (on probation)

M. C. L. Smith. Dated 18th March, 1937, with seniority from 31st October, 1936.

B. M. Wheeler. Dated 20th March, 1937, with seniority from 31st October, 1936.

C. H. Bliss. Dated 3rd April, 1937, with seniority from 1st November, 1936.

A. H. W. Mitchell. Dated 21st March, 1937, with seniority from 1st March, 1937.

A. M. McGavin. Dated 17th May, 1937, with seniority from 28th December, 1936.

J. D. O'Shaughnessy. Dated 17th May, 1937, with seniority from 28th December, 1936.

J. E. O'Donnell. Dated 19th May, 1937, with seniority from 28th December, 1936.

D. R. Cattanaach. Dated 18th May, 1937, with seniority from 28th December, 1936.

W. J. Young. Dated 17th June, 1937, with seniority from 1st February, 1937.

The seniority of Lieutenant (on probation) G. F. J. Thomas is antedated to 13th October, 1936.

#### RELINQUISHMENT

(Temporary Commission)

Lieutenant Gurbuxsh Singh. Dated 31st May, 1937.

#### RETIREMENT

Colonel A. A. McNeight. Dated 9th July, 1937.

#### RESIGNATION

Captain P. K. S. Gupta resigned his temporary commission from 21st April, 1937.

## Notes

### ANTHIOMALINE

**Composition.**—Lithium antimony-thiomalate.

**Properties.**—An organic compound containing 16 per cent of antimony for intramuscular injection. Does not produce fits of coughing and sickness, is of low toxicity and is well tolerated locally and generally.

**Use.**—For intramuscular injection in the treatment of lymphogranuloma inguinale and bilharziasis.

**Administration.**—Anthiomaline is administered by intramuscular injection into the upper outer quadrant of the buttock, the site being well massaged after the injection has been given.

Adult dose: 2 c.cm. given two or three times a week until a total of 2 grammes has been administered. It is customary to commence with a first injection of 0.5 c.cm. increasing by 0.5 c.cm. until the normal dose of 2 c.cm. is reached.

**Packing.**—Boxes of 10 × 2 c.cm. ampoules, each cubic centimetre containing the equivalent of 0.01 gramme of antimony metal.

### A NEW ARSENICAL

MAPHARSIDE (Parke, Davis and Co.) is a new arsenical known in America as Mapharsen. It is a practically pure chemical compound (meta-amino-para-hydroxy-phenylarsine oxide), the hydrochloride of the substance frequently referred to as 'arsenoxide'.

Arsenoxide has long been recognized as an active spirocheticide. It was one of the early group of arsenobenzenes which included arsphenamine but only during the last five years has it received an extensive investigation into its use as a therapeutic agent in syphilis. Interest developed from the hypothesis that as the arsphenamines are not directly spirocheticidal they owe their activity and beneficial effects to arsenoxide, the substance normally produced in the body on their oxidation. To investigators the compound possessed the advantage of comparative stability in solution, for it does not become more toxic but is gradually oxidized to less toxic phenylarsenic acid.

As the result of these investigations Tatum and Cooper (An Experimental Study of Mapharsen: *J. Pharmacol. and Exper. Therap.*, 50, 198, 1934) and Gruhitz and his associates (*Arch. Dermat. and Syph.*, 32, 848, 1935)

reported on the value of Mapharside in experimental syphilis. Foerster (*Arch. Dermat. and Syph.*, 32, 868, 1935) and other workers reported favourably on its use in small groups of patients, and more recently, Gruhitz and associates (*Arch. Dermat. and Syph.*, 34, 432, 1936) in an article 'Mapharsen in Mass Treatment of Syphilis in a Clinic of Venereal Diseases' stated, 'Mapharsen in mass treatment of syphilis when used in conjunction with heavy metal appeared prompt in action; it caused no severe unfavorable reactions, and mild reactions were fewer than those produced by the arsphenamines. It caused prompt and sustained reversal of a positive reaction of the blood. Mapharsen was not found to possess cumulative retention in the body. It is a safe and potent drug for the treatment of syphilis'.

Briefly, it is claimed that Mapharside has a non-variable composition providing constant therapeutic activity, is spirocheticidal *in vitro* and does not contain superfluous arsenic thus enabling the treatment of syphilis with doses one-tenth those of arsphenamines.

The initial dose of 0.02 gm. is increased to 0.04 gm. for the second and third injections and then to the maximum dose of 0.06 gm. Injections are given weekly by the intravenous route and the makers recommend that these be made rapidly and completed within 30 seconds.

Mapharside is supplied in ampoules of 0.04 and 0.06 gm.; the contents do not require neutralization but are ready for use when dissolved in 10 c.cm. of water.

Further particulars can be obtained on application to Messrs. Parke, Davis and Co., P. O. Box 88, Bombay.

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## Original Articles

### A NOTE ON A CIRCUMSCRIBED OUTBREAK OF A TYPHUS-LIKE FEVER IN MUZAFFARGARH DISTRICT, SOUTH-WESTERN PUNJAB

By M. YACOB, M.B., B.S., D.P.H., D.B., D.P.H., D.T.M. & H.  
*Epidemiologist to Government, Punjab*

On report by the civil surgeon, Muzaffargarh, regarding an outbreak of fever of unknown aetiology in his district, the writer visited the area under instructions from the Director of Public Health, Punjab, in May 1937.

The outbreak had been reported from two adjoining villages, Yusufwala and Salehwali. These, like other villages in the area, consisted of a few isolated hamlets of mud-walled huts with thatched roofs and were surrounded by an extensive area of jungle land covered with brushwood and scrub. The population of both the villages consisted of about fifty individuals, most of whom were engaged in agricultural pursuits. At Yusufwala, seven cases which had either completely recovered from the disease or were in a convalescent state were seen. In the other village four cases were found. The histories of the cases seen in Yusufwala are as follows :—

*Case 1.*—R. H., Muslim male, aged about 12, was the first case. Two months and a half ago he developed a small blister followed by an area of necrosis on the ring-finger of the left hand accompanied by high fever which lasted for about a fortnight. The axillary glands of the left side became swollen and painful. The patient consulted the village barber who made a small incision in the inflamed region of the axilla when some sero-sanguineous material was evacuated. The patient felt very weak for some time but at the time of my visit had almost completely recovered and his wounds had healed up. There was no history of a rash in this case.

*Case 2.*—D. H., Muslim female, aged about 14, sister of the first patient, developed the disease a few days later with similar symptoms. In her case the pyrexia lasted for about 10 days and there was history of an erythematous eruption on the trunk which appeared during the fever and persisted for a fortnight. At the time of my visit she had completely recovered.

*Case 3.*—A. H., Muslim female, mother of the first two persons, aged about 35, was the third case which occurred almost simultaneously with the second. She also gave a history of the development of a small area of local necrosis on one of her hands followed by the enlargement of the axillary glands of the same side and high fever which lasted for about ten days. During the fever a rash appeared all over her body and lasted for about three weeks.

*Case 4.*—S. A. B., Muslim male, aged about 22, used to visit the house of patient no. 2 to whom he was engaged. During the illness of his betrothed he pricked one of his fingers and applied the bleeding point to the necrosed area on her finger in the hope of curing her. A few days later he developed a local necrotic lesion on his own finger followed by signs of lymphangitis and lymphadenitis. This was accompanied by high fever of a fortnight's duration. The patient was very weak and anæmic at the time of my visit. There was no clear history of a rash.

*Case 5.*—F. H., Muslim female, aged about 20, living in the same village developed the disease about the same time as case no. 4. In her case the fever lasted for about a week and during its course an erythematous

eruption appeared on her chest and abdomen which disappeared after three weeks.

*Case 6.*—M. B., Muslim male, aged 16, developed a blister on the right buttock about two months ago followed by fever of a fortnight's duration. There was history of a rash on the body which was said to have lasted for 40 days. The blister was incised by the village barber and had progressed on to ulceration. At the time of my visit the size of the ulcer was about 4 inches by 3 inches. The patient was very weak and anæmic. The spleen was enlarged two fingers below the costal margin.

*Case 7.*—B. H., Muslim female, aged about 20, aunt of the first three persons, gave an almost identical history. She was, however, not clear regarding the development of a rash during the course of her illness.

In the next village, Salehwali, four cases were found, two of which had completely recovered while the other two were in a convalescent state. The outbreak in this village occurred a few days after the disease had made its appearance at Yusufwala. There was history of the appearance of a rash in two of the cases and the site of the initial lesion was the dorsum of the foot. A history of lymphangitis and lymphadenitis was given by all. Blood sera and blood films obtained from most of the cases were examined. The results are as follows :—

Case no.	Wilson-Weil-Felix reaction	Differential count in percentages
1	Positive up to 1 in 80 with proteus OX 19. Negative with proteus OX Kingsbury.	Lymphocytes .. 40 Large mononuclears .. 11 Polymorphonuclears .. 45 Eosinophiles .. 4
2	Positive up to 1 in 40 with proteus OX 19. Negative with proteus OX Kingsbury.	Lymphocytes .. 40 Large mononuclears .. 6 Polymorphonuclears .. 48 Eosinophiles .. 6
3	Not done ..	Lymphocytes .. 30 Large mononuclears .. 10 Polymorphonuclears .. 60 Eosinophiles .. 0
5	Positive up to 1 in 80 with proteus OX 19. Negative with proteus OX Kingsbury.	Lymphocytes .. 11 Large mononuclears .. 4 Polymorphonuclears .. 85 Eosinophiles .. 0
6	Negative with proteus OX 19. Negative with proteus OX Kingsbury.	Lymphocytes .. 29 Large mononuclears .. 4 Polymorphonuclears .. 65 Eosinophiles .. 2
7	Positive up to 1 in 20 with proteus OX 19. Negative with proteus OX Kingsbury.	Lymphocytes .. 35 Large mononuclears .. 5 Polymorphonuclears .. 60 Eosinophiles .. 0
8	Positive up to 1 in 80 with proteus OX 19. Negative with proteus OX Kingsbury.	Lymphocytes .. 32 Large mononuclears .. 4 Polymorphonuclears .. 62 Eosinophiles .. 2
9	Positive up to 1 in 80 with proteus OX 19 and up to 1 in 40 with proteus OX Kingsbury.	Lymphocytes .. 31 Large mononuclears .. 6 Polymorphonuclears .. 58 Eosinophiles .. 5

The blood films of all cases were negative for malarial parasites and the spirochæte of relapsing fever. Likewise, the agglutination tests were negative with *Bact. typhosum*, *Bact. paratyphosum A* and *Bact. paratyphosum B*.

The cases described above are of interest as furnishing evidence of the occurrence in this province of a typhus-like fever which is probably identical with or is closely related to the mite-borne typhus-like fever of Japan and Sumatra. The presence of a blister or local ulcerated sore as the initial lesion followed by the development of lymphangitis together with the history of an erythematous eruption in some of the cases serves to strengthen this hypothesis. Further confirmatory evidence is available in the form of a positive Wilson-Weil-Felix reaction, although in low dilutions—the maximum being 1 in 80—in 6 out of 7 cases in which the test was carried out. It is possible that the test would have been positive in higher dilutions had it been carried out during the course of actual illness. Unfortunately, the cases were only available for examination after their recovery from an attack of the disease or during convalescence.

During the course of the investigation a search was made for the presence of lice, mites and ticks but none was found in the houses or on the bodies of the patients. In the absence of positive proof it is not possible to incriminate or name any special vector.

Megaw, Shettle and Roy (1925) and Megaw (1925) have mentioned the occurrence of a typhus-like fever in Central India and various other parts of this country which Megaw has designated as Indian tick typhus. The symptoms described and the mode of onset, however, are entirely different from the cases referred to above. There was no history of an initial lesion on the extremities as in the present series of cases. Megaw (1934) has adopted the following classification of typhus fever :—

- A. Epidemic or louse typhus.
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  - (a) Tick typhus.
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  - (c) Flea typhus.
  - (d) Typhus of unknown vector.

According to this classification the cases under reference would belong to the last category, typhus of unknown vector. In this connection Lal and Jacob (1923) observed and recorded, during the course of their work in connection with the epidemic of relapsing fever which ravaged the rural areas of Muzaffargarh District in 1922-23, that a certain number of cases in a particular area of the district suffered from a continued type of fever with a positive Wilson-Weil-Felix reaction and concluded that 'some of the observations and laboratory tests strongly suggest the probability of typhus fever having

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## ANÆMIA OF PREGNANCY\*

By SUBODH MITRA, M.B. (Cal.), Dr. Med. (Berlin),  
F.R.C.S. (Ed.), M.C.O.G. (Lond.)

Associate Professor of Obstetrics and Gynaecology,  
Carmichael Medical College; Surgeon to Sir Kedarnath  
Maternity Hospital; Surgeon, Seva-Sadan Women's  
Hospital, Calcutta

In India, anæmia of pregnancy is one of the important questions of the day on account of its increased frequency and enormous mortality. Although good work has been done by way of ætiological investigation, clinical study and therapeutic experimentation, the real cause has not yet been found. There is a great deal of variation of data even amongst the few workers for want of proper standardization of different

\* Paper read at the First Clinical Meeting of the Bengal Obstetrical and Gynaecological Society, held in March 1937.

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occurred in certain areas of Muzaffargarh District concurrently with relapsing fever'. It is thus evident that typhus transmitted by an unknown vector is liable to occur from time to time in Muzaffargarh District.

### Conclusions

From the facts stated above it may be concluded that the recent circumscribed outbreak of fever reported from Muzaffargarh District was caused by the virus of typhus transmitted by an unknown vector. The points of special interest are the relatively low virulence of the disease and the development of an area of local necrosis at the site of infection associated with lymphangitis.

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[Note.—This paper is of value as it draws attention to still another area in India where typhus-like fevers exist. It is unfortunate, however, that a more complete record of contacts between some of the cases and between inhabitants of the two villages was not obtained.

The author states that the disease appears identical with the mite-borne typhus of Japan but on account of failure to find an insect vector it has been placed in the 'unknown vector' group.

The maximum dilution of 1 in 80 for positive agglutination is hardly high enough for a definite positive diagnosis to be made, and it is a pity unaffected controls in the villages were not examined. Failure to find spirochætes in the blood is not conclusive evidence of the absence of relapsing fever, at the stage at which the blood was taken.—EDITOR, I. M. G.]



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months of the appearance of symptoms, and in about 80 per cent of cases, their general condition is low on admission.

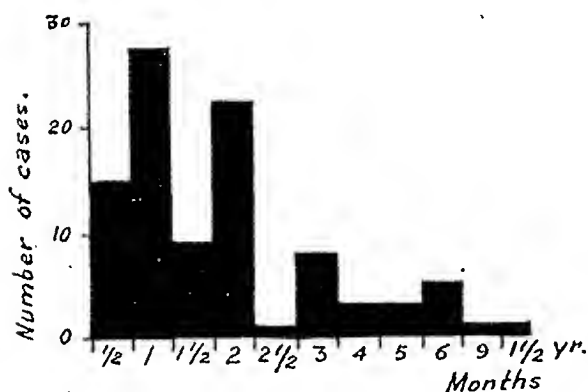


Fig. 5.—Onset of symptoms before seeking treatment.

**Gastro-intestinal disturbances.**—These were present in 34 cases, and they were distributed month by month as shown in figure 6 pointing to their more frequent prevalence in the second half of year than in the first half.



Fig. 6.—Gastro-intestinal symptoms.

**Œdema.**—One hundred and thirteen cases had œdema either in the form of puffiness of the face or generalized.

**Cardio-vascular system.**—The cardio-vascular system is greatly damaged in pregnancy anæmia. Breathlessness and palpitation are present in almost all cases, and pulsation is visible in the neck, precordium and sometimes in the epigastrium. In most of the cases the heart is dilated. The first sound is soft and short, and the interval between the first and second sounds is short, and a hæmic murmur is present. We have done a series of ortho-cardiograms, and in one of my previous communications (1933) I made a record of some of them. The ratio between the dimensions of the right heart to that of the left is altered. In these cases basal breadth is distinctly greater than the longitudinal dimension.

On screen examination in the erect position, the heart shows a normal form in inspiration resting on the diaphragm, but in expiration it appears like a formless mass, as if in the form of a badly filled purse. This sign of expiratory flattening is a sign of a relaxed atonic heart. Its longitudinal axis has moved more to the right. The form of the heart is completely altered, it appears, so to speak, broken up, it broadens out to the left and in very bad cases

it takes up the form of the cupola of the diaphragm. We have also tried to make electrocardiographic studies of a few typical cases of anæmia of pregnancy. The graph indicates that the myocardium is weak, flabby and atonic, because of the absent 'T' in leads I and III and small 'T' in lead II (Mitra, 1933).

**Hæmatological investigation.**—Hæmatological investigation forms an important part of the work in the study of anæmia of pregnancy. Perhaps the most accurate study, at present available, would be mean corpuscular volume and mean corpuscular hæmoglobin concentration percentage as propounded by Wintrobe and subsequently worked out by many investigators, particularly by Adair, Dieckmann and Grant.

(1) **Mean diameter of red cells.**—Halometric estimation was done in 103 cases. The blood picture is not an entirely typical macrocytic one. Table I shows that 52 of them are macrocytic and 51 normocytic (the diameter varying between 6.7 to 7.7  $\mu$ ). It further shows that of 52 macrocytic cases, 8 only are hyperchromic, 14 orthochromic (where the colour index is 1) and 30 hypochromic. In the normocytic group—there are none hyperchromic, 4 orthochromic and 47 hypochromic. Table II shows the distribution of macrocytic and normocytic cases in different clinical groups formulated by me.

TABLE I

Macrocytic 52	(a) Hyperchromic	8
	(b) Orthochromic	14
	(c) Hypochromic	30
Normocytic 51	(a) Hyperchromic	0
	(b) Orthochromic	4
	(c) Hypochromic	47

TABLE II

Group	Macrocytic	Normocytic
I	11	3
II	13	20
III	10	12
IV	18	16

(2) **Red cell count.**—Figure 7 shows 2 cases where the red cells are less than half a million, 39 cases between 0.5 to 1 million, 39 cases between 1.1 to 1.5 million, 57 cases between

greatest frequency is found between 21 and 25 years.

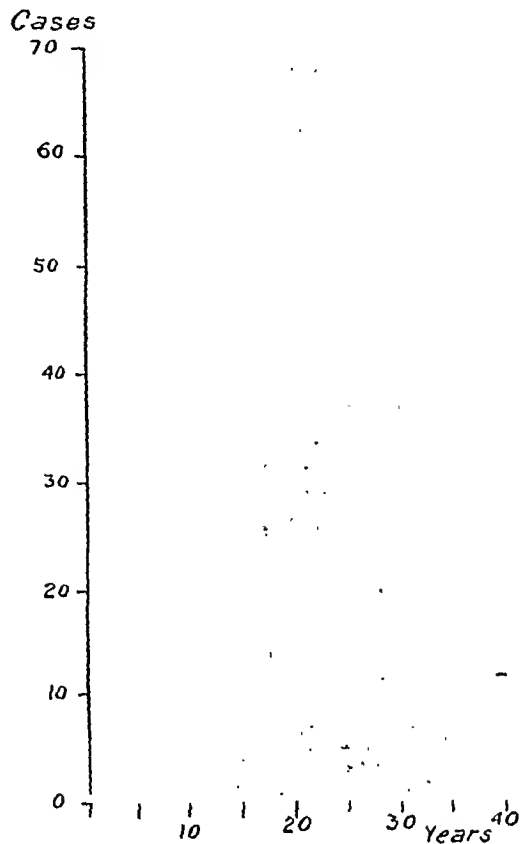


Fig. 1.—Age incidence.

**Parity.**—Figure 2 shows greater incidence in multiparæ (80 per cent) than in primiparæ.

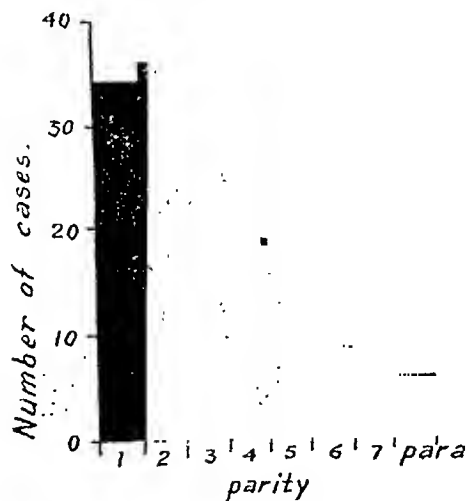


Fig. 2.—Relation to number of pregnancies.

**Seasonal variation.**—As I have shown in my previous communication (Mitra, 1931), this disease is more prevalent during the second half of the year (figure 3). This has also been found by Balfour (1927) and Wills (1931) in Bombay, but Mudaliar finds in Madras the majority

occurring in the first half of the year (figure 3), the maximum number being in June, the hottest part of the year.

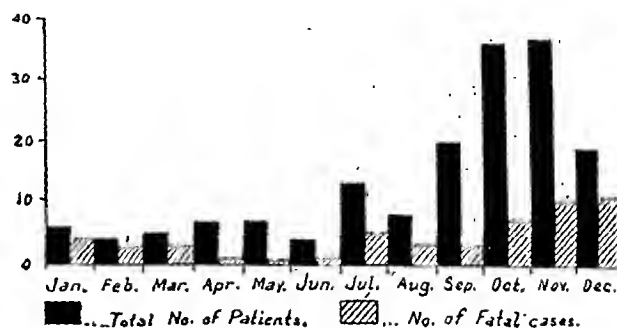


Fig. 3.—Seasonal variation.

**Prematurity.**—It is not common to find anæmia of pregnancy during the early part of pregnancy. Figure 4 shows it most common during the second and third trimestra. In this series no case was found before the 5th month.

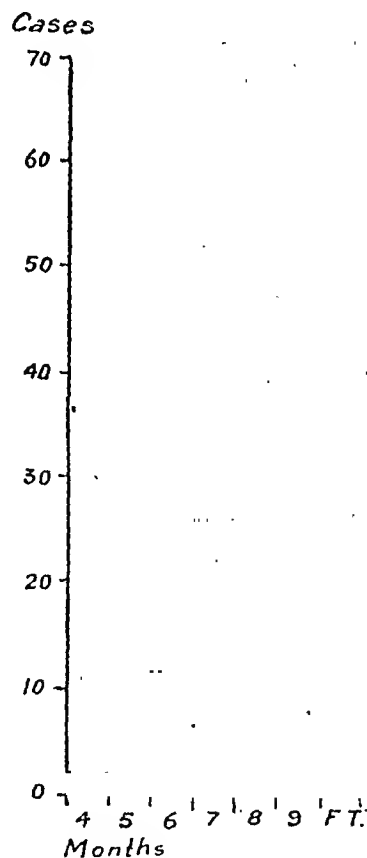


Fig. 4.—Prematurity.

**Onset.**—The onset is very insidious. The patient does not feel ill except perhaps there is slight breathlessness on exertion, mild gastrointestinal disturbances, puffiness of face and blanched appearance. Figure 5 shows that patients seek treatment mostly within two

**Management.**—The treatment of anæmia cases is almost invariably inadequate and is given indiscriminately. Proper and scientific treatment cannot be given unless it is well controlled by regular laboratory examinations. The agents which are at present much in vogue in dealing with anæmia of pregnancy are: liver, stomach, marmite, iron and blood, besides glucose, digitalis and other cardiac stimulants. For macrocytic anæmia, liver and marmite are extensively used with good results; for normocytic and microcytic anæmias (which are sometimes called iron deficiency anæmia) iron gives favourable results. What we have found useful in our cases is a combined method of treatment consisting of iron, marmite and liver along with glucose and digitalis because in our opinion no case is purely macrocytic or microcytic. Cells in different stages are found in practically every case and they can be better dealt with in a combination of agents supposed to be useful in the treatment of anæmia.

Rational treatment depends upon rational understanding of each individual case. All the anæmia cases that are generally associated with pregnancy are due to (1) iron deficiency, (2) deficiency of Castle's pernicious anæmia factor or (3) toxæmia producing either erythrolysis, anhmopolesis or both.

**Iron therapy.**—The supply of iron in food is very small and of this only a part is available. Thus dietary deficiency plays an important rôle and in pregnancy it is further affected by the drain of iron (375 mgm.) into the fœtus and in lactation (750 mgm.). Iron is better utilized in normal gastric secretion (Minot and Heath, 1932) or when given in an acid buffered meat mixture (Mettier and Minot, 1931) in the absence of sepsis or other complications.

By treating a case of anæmia with iron a rough working rule, as suggested by Heath (1933), is a rise of at least 1 per cent per day when hæmoglobin is below 70 per cent. It requires 23 mgm. ( $\frac{1}{4}$  gr.) of iron in the circulation per day to produce a rise of 1 per cent per day in the circulating hæmoglobin.

Iron must have been accumulated in great excess in the tissues, the so-called iron-hungry tissues, and then utilized. Thus excess of iron may be more effective than enough iron. There is a sort of mass action in the intestine and no iron is absorbed at all until large doses are given (Brock, 1937).

The other explanation given by Brock is that massive quantities of iron might alter the bacterial flora and by altering the chemical environment increase the absorption of some undetected hæmopoietic factor. Thus rational iron therapy consists in giving adequate doses. Preparations which are in use at present are iron and ammonium citrate, Bland's pills, or exsiccated ferrous sulphate. The mode of administration should always be by the oral method. Injection of iron is not very suitable because the amount of iron (23 to 46 mgm.)

necessary in the circulation to increase the hæmoglobin from 1 to 2 per cent per day cannot be given comfortably without untoward results (Heath, Strauss, and Castle, 1932).

Rowland (1933) suggests a 50 per cent solution of iron and ammonium citrate in one drachm doses is well borne if taken in fruit juice or broth through a tube and a maximum of 90 to 120 grains a day is given. Effective results are seen on the third or fourth day; there is a marked sense of well-being with rapid disappearance of dyspnœa, weakness and soreness of tongue and gastro-intestinal disturbances. There should be a maintenance dose of 1 gm. of iron and ammonium citrate per day.

**Extrinsic or P. A. factor therapy.**—One of the important ætiological factors of anæmia is deficient intake of extrinsic factor from defective diet. This factor is supposed to be found in liver, stomach and yeast products. The anti-anæmic factor has not yet been isolated, although Whipple claims to have found such a material. Colin, McMeekin and Minot (1930) extracted from whole liver a small basic, nitrogenous compound, called the P. A. factor (Vaughan), which induces satisfactory remission in macrocytic hyperchromic anæmia but not in secondary anæmia. A similar substance has been claimed to be present in marmite by Wills (1933), Godall (1932) Ungley (1932) and Davidson *et al.* (1935) which according to Wills is not vitamin B<sub>1</sub>, B<sub>2</sub> or B<sub>4</sub> but 'some protein breakdown product formed in the process of autolysis rather than vitamin B<sub>2</sub>' (Vaughan).

Liver is administered either as raw liver pulp or as an extract orally, intramuscularly or intravenously. Single massive doses of liver extract introduced into the stomach by tube have been tried but not found suitable. Oral administration is quite convenient and economic provided there is no gastro-intestinal disturbance present. Unless the adequate dose be given (about half a pound of fresh liver or its equivalent) no appreciable result can be expected. Intravenous administration has been claimed to be the most potent method, where the action is said to be increased three thousand-fold as compared with liver given orally. We have got very satisfactory results by daily intramuscular injections of liver extract. Failures are due to inadequate dosage, giving it for too short a period, and its administration in cases complicated with infection and other morbid conditions. As evidenced from table I where one can find the preponderance of the hypochromic type of anæmia associated with macrocytosis, we have found very good results by combining iron with liver. Similar satisfactory results have also been found by Keeper and Young and Mudaliar.

So far as so-called vitamin therapy is concerned, although excellent results were obtained by Wills and Vaughan, contradictory results were given by Mudaliar; our results are neither

1.6 to 2 million and 22 cases between 2.1 to 2.5 million.

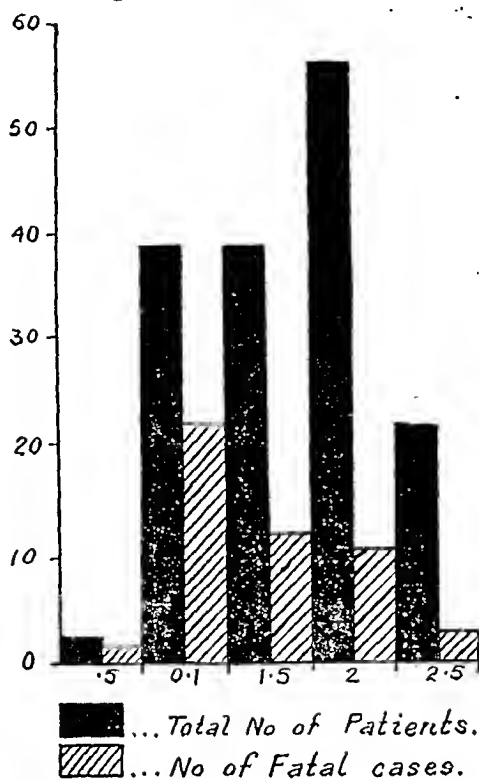


Fig. 7.—Red cells in million.

(3) The hæmoglobin value has been illustrated in figure 8 which shows 6 cases below 10 per cent hæmoglobin, 27 cases between 10 to 15 per cent, 13 cases between 16 to 20 per cent, 24 cases between 21 to 25 per cent, 37 cases between 26 to 30 per cent, 38 cases between 31 to 35 per cent, 13 cases between 36 to 40 per cent, and only one case between 41 to 45 per cent.

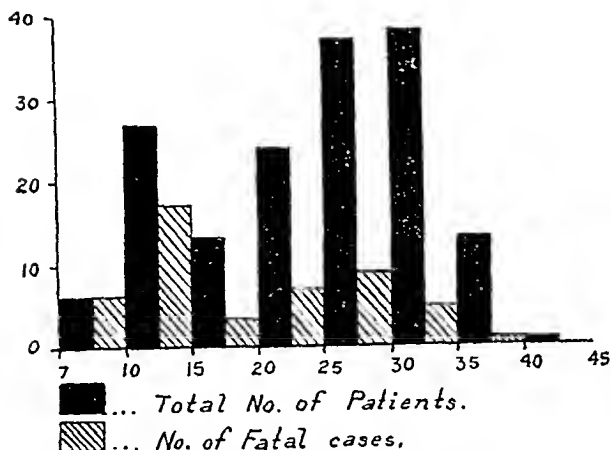


Fig. 8.—Hæmoglobin percentage (Sahli).

(4) *Leucocytes*.—Figure 9 indicates that only a few cases show leucopænia; there is, on the other hand, a tendency to leucocytosis.

(5) *Biochemistry*.—Table III shows blood calcium, urea nitrogen, cholesterol content, non-protein nitrogen and chloride content of blood.

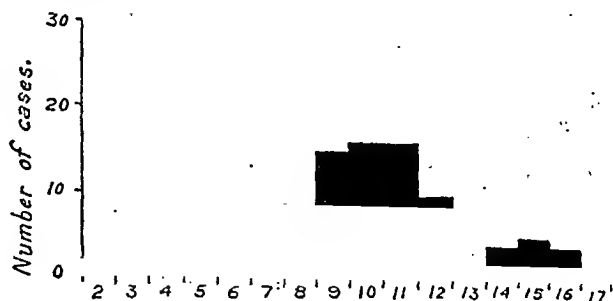


Fig. 9.—Leucocytes in thousands.

The cases are too few to give any conclusive idea.

TABLE III

Cases	Bl. Ca.	Ur. N.	Cholesteroline	N. P. N.	Chl.
Normal	9 to 11	12 to 15	140 to 200	20 to 40	500
1	10.6	12.5	120	30.8	593
2	10.2	..	125	33.6	483.3
3	..	21.5	85	44.8	450
4	..	12.5	135	30.8	583.3
5	..	17.5	125	39.2	500
6	11.5	17.5	105	39.2	550
7	9.4	10.5	140	22.4	558.3
8	..	56	..	23.2	..
9	..	14	125	33.6	480

*Gastric analysis in pregnancy anaemia* was done in 6 of our cases. There was hypochlorhydria in 4, all of normocytic type, achylia in one, also of normocytic type, and hyperchlorhydria in one case of hyperchromic type. Divergent reports are available from different observers. Wills and Mehta report hyperchlorhydria in such cases. Paterson, Field and Morgan report free hydrochloric acid present. Mudaliar reports hypochlorhydria in the majority of the cases and in a few achlorhydria; out of his 10 cases, 4 had achlorhydria and 5 hypochlorhydria and 1 was normal.

*Anæmia in previous pregnancies*.—It is not without importance to notice that there is a recurrence of anæmia in 20 cases of this series. Table IV shows its distribution in different groups, with the number of fatal cases in each group. Besides these 20 cases, we have occasionally met in practice cases having anæmia in repeated pregnancies.

TABLE IV

*Anæmia in previous pregnancy*

Group	I	II	III	IV
Number	4	8	3	5
Mortality	..	3	..	1

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IV	Milled Indian corn, wheat gluten, calcium carbonate, sodium chloride, skimmed milk, butter, tomato juice, powdered wheat germs and cod-liver oil, all boiled together for half an hour.
V	Milled Indian corn, wheat gluten, calcium carbonate, sodium chloride, butter, milk, powdered wheat germs and tomato juice.  As the feeding experiments were done in the months of October and November, the milk, according to Coward (1928), was devoid of any vitamin D supply.

It is evident from the table that batch I was the normal one for control, whereas batches II, III, IV, and V formed the groups deficient in vitamins A, B<sub>1</sub>, C, and D respectively. These animals were kept on experimental diets for a month and a half, during which time their metabolism, as recorded by oxygen consumption per hour, was noted every week by the metabolism apparatus for small animals, devised by Sharpey-Schafer (1932), and their weight was also taken. All the deficient animals showed more or less increased metabolism and consequently some loss of weight, the maximum being in the case of batch II, during the period of experimental feeding. On the expiry of this period the animals were killed by taking the blood for calcium estimation and their glands were also taken out for histological study.

For the estimation of the calcium content of the blood of individual animals the choice of the animal of experiment (albino rat) was rather unfortunate. A sufficient quantity of blood required for the purpose could not be obtained from each individual animal, so blood from three

of each batch had to be pooled for the estimation. The first four groups showed practically no alteration in the calcium content of the blood, while the last one exhibited a slight lowering, by 1 to 1.5 mgm. only.

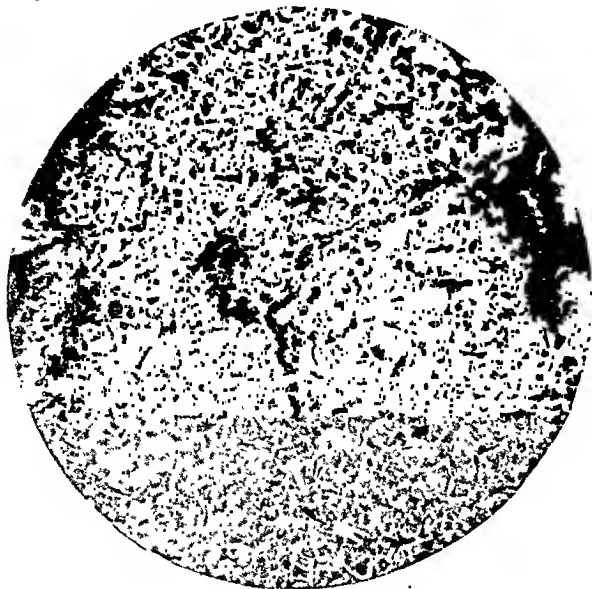


Fig. 1.—Normal parathyroid gland (rats).  $\times 195$ .

As the parathyroids in rats lie embedded in the thyroid tissue, the thyroid glands on either side had to be taken out and sections cut and stained in long series. Only a few of the sections showed the structure of the parathyroid gland, from which the changes in the histological

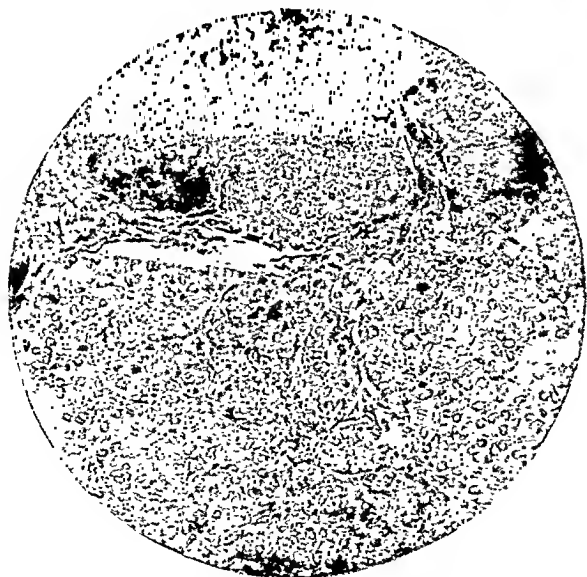


Fig. 2.—Parathyroid gland of animals (rats) on vitamin A deficient diets.

structure of the glands of the experimental animals, as compared to those of the normal controls, were noted.

Histologically, the glands of batch I showed that epithelial cells in the interior of the gland are compact and closely packed, some are round

while others are elongated and contain round spindle-shaped or elongated nuclei which stain deeply. The connective tissue is comparatively small in amount and the blood sinuses are few and far between. The principal cells are much

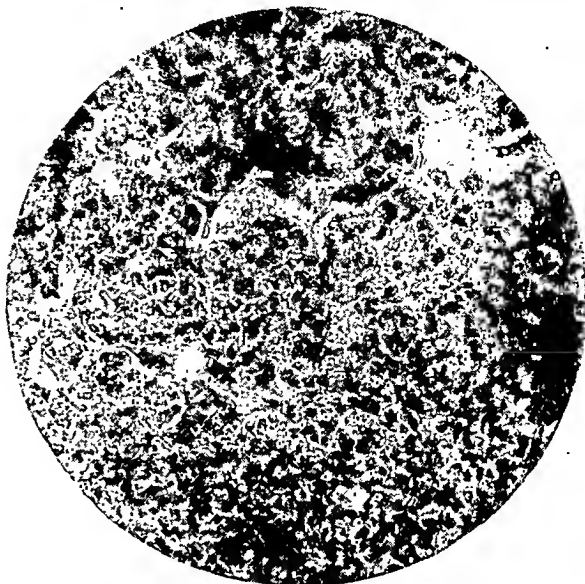


Fig. 3.—Parathyroid gland of animals (rats) on vitamin  $B_{12}$  deficient diet.

more numerous than the acidophil cells (figure 1).

Those of batch II showed some amount of cytolysis. The nuclei are less distinct and the blood sinuses are bigger. The areas where cells are breaking down have a tendency to be filled

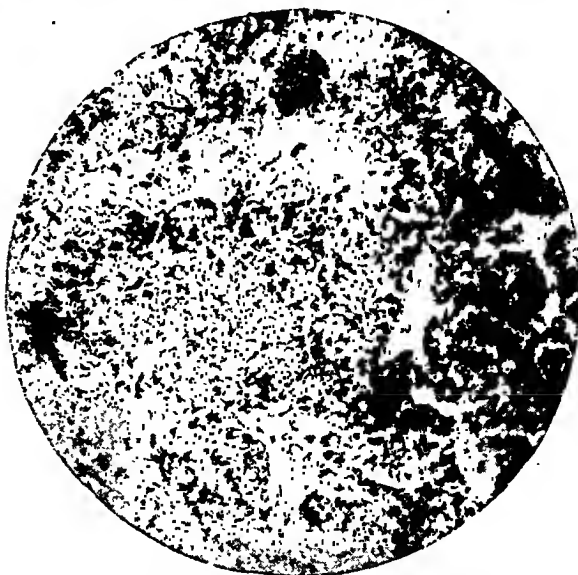


Fig. 4.—Parathyroid gland of animals (rats) on vitamin C deficient diet.

up by colloid-like material. There is also an increase in the connective tissue. The eosinophil cells are very few in number (figure 2).

The glands of batch III showed closely-packed epithelial cells. There are areas of colloid degeneration and the nuclei are stained

dark brown where degeneration is most marked. The blood sinuses are few and the connective tissue is scanty. There is a tendency to increase in the number of the acidophil cells (figure 3).

The epithelial cells of the glands of batch IV have a whorled arrangement, compact and very closely packed. There are areas of disintegration with dark brown nuclei, and hæmorrhagic patches. The blood sinuses are numerous and the connective tissue is moderate in amount. The acidophil cells as compared with the normal are much more numerous (figure 4).

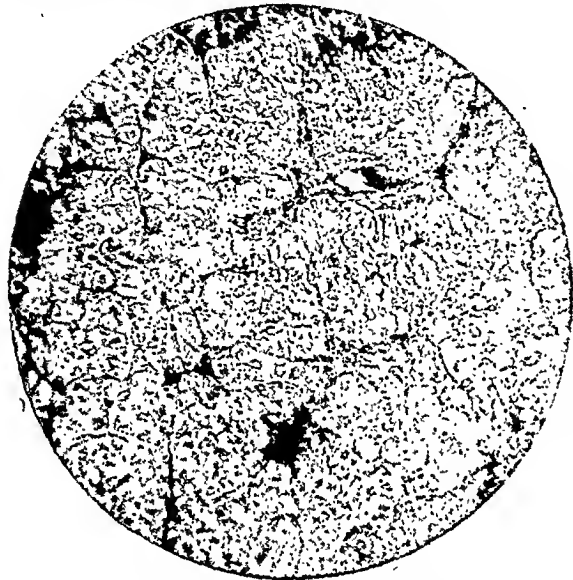


Fig. 5.—Parathyroid gland of animals (rats) on vitamin D deficient diet.

Those of batch V showed the epithelial cells in a state of hypersecretion, being loosely packed with strands of connective tissue in between. The nuclei are mostly round or oval and have taken lighter staining. The principal cells are numerous and are very prominent and the eosinophil cells are very few (figure 5).

#### Discussion

From the above it is evident that in vitamin A and B<sub>1</sub> deficiency there is a tendency to some degeneration (colloidal in nature) in the substance of the glands, whereas in vitamin C deficiency some amount of disintegration with hæmorrhagic patches is noticed here and there. McCarrison (1917) also noticed similar hæmorrhagic infiltration causing disruption of the polygonal cells in the glands of monkeys on a diet of autoclaved rice and butter (with all its vitamin C content lost). The glands of animals on vitamin D deficiency showed the principal epithelial cells to be hypersecreting. In vitamin B<sub>1</sub> and C deficiency the acidophil cells are also comparatively increased in number.

These histological changes in the glands of animals on deficiency diets proved clearly the influence of vitamins in maintaining the healthy condition of the secreting cells, in the absence

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## LEAD POISONING FROM THE LINING OF COPPER OR BRASS COOKING UTENSILS, WITH THE REPORT OF A CASE

By MIN SEIN, M.B., M.R.C.P.  
CAPTAIN, I.M.S.

Civil Surgeon, Toungoo, Burma

ONE of my sub-assistant surgeons, a Hindu male aged 40, consulted me some time in June 1936 on account of griping pains in the abdomen with distension and frequency of stools. The stools were said to have been offensive, sometimes liquid and frothy, and two to four a day in number. The pain in the abdomen was of a colicky nature and was relieved by pressure and also by defæcation and was unrelated to food. The distension of the abdomen occurred usually at night and frequently disturbed his sleep. He was easily fatigued and listless and was not able to concentrate much. There was no nausea or vomiting and the temperature had been normal. He said he had had a rather severe attack during the last

(Continued from previous column)

of which they deteriorate and disintegrate. McCarrison (1921) is of opinion that 'excess of fat and starchy food together with deficiency of vitamins enhance the susceptibility of the organs to the action of the intestinal anaerobes' responsible for the hæmorrhagic infiltration of the diseased parathyroids. In deficiency of vitamin D, however, the glands are found in a hypersecreting condition and the destructive changes are less evident; this is probably to combat successfully the slight lowering of the blood calcium level. All these findings amply corroborate the statement of McCarrison (1921) that 'in the presence of food deficiency the functional perfection of the thyro-parathyroid mechanism is very prone to be impaired' though it was based on meagre data.

#### Conclusion

Vitamins A, B<sub>1</sub> and C seem to have a profound effect in maintaining the healthy condition of the secreting cells of the parathyroid glands. Vitamin D, on the other hand, appears to promote a resting phase in the glands, in the absence of which the principal cells become hyperactive.

This investigation was commenced in the physiology department of the Edinburgh University and was later on completed in the department of physiology of the Prince of Wales Medical College, Patna.

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two days prior to his seeing me. It was elicited that the condition had been going on since May with remissions, but the attacks had then been mild and consisted chiefly of irregularity of the bowels which tended to be loose and there was a feeling of distension in the abdomen.

*Previous history.*—The patient suffered from 'enteritis' in 1926, amœbic dysentery in 1928 and datura and lead poisoning in 1934. In the last instance the urine had contained both datura and lead and a compounder was suspected of having administered the drugs. Since then the patient had been perfectly fit.

*Personal history.*—The patient was a vegetarian and lived chiefly on fruits, vegetables, *chappati* and milk. He was a non-smoker and total abstainer. There was nothing of note in the family history.

Physical examination did not yield anything of note. The patient was thick-set and short and his hair appeared to be prematurely grey. The tongue appeared a little raw. There was no tenderness in the abdomen. Spleen and liver were not enlarged. Heart and lungs were normal. The blood pressure was not taken. Routine examination of the stool and urine did not yield any abnormal result. The question of sprue was considered but was thought to be improbable and it was decided to keep him under observation and treat him with palliatives. He was prescribed gastric sedatives and carminatives and was advised as to his diet. The patient informed me subsequently that just about this time he suffered from pain in the joints, particularly in the wrist and phalangeal joints. But these symptoms were not brought to my notice during the consultation. The condition was very much relieved and nothing further was done. About the beginning of October 1936 all the symptoms recurred with greater intensity. The griping pains became worse and were frequently accompanied by pain in the back and legs. There was marked distension of the abdomen and the patient also suffered from palpitation and precordial pain and insomnia. He was much worried and presented the picture of a neurasthenic. The patient was admitted into Toungoo Civil Hospital on 3rd October, 1936. He stated that since the onset of the illness he had lost ten pounds in weight. He also complained of sore tongue.

The patient was obviously in great discomfort. The tongue was raw in the centre and on the edges with normal areas intervening. There was no blue line. The abdomen was distended. The liver and spleen were not enlarged. The lungs were clear. The cardiac sounds appeared a little weak, otherwise there was nothing abnormal in the circulatory system. The pulse was soft and regular. Blood pressure was 120/85. Neurological examination was negative. Pupils reacted to light and accommodation. All the reflexes were normal but wrist jerk was not tried. Qualitative examination of the urine was normal. Intestinal flagellates were discovered in the stool, but there were no ova or cysts of common intestinal parasites. The patient was kept in bed on milk diet, and a powder

consisting of bismuth subnitrate, calomel and Dover's powder was prescribed. The next day the dragging sensation in the legs was worse, and the abdominal discomfort and distension were unrelieved. The patient passed loose stools. As the symptoms pointed to enteritis olive oil was prescribed.

There was only a little relief from the symptoms, and, suspecting that the case might be one of poisoning by lead or some other heavy metal, a careful enquiry was made as to the patient's diet, the source of water supply, etc., but no useful information was obtained. The patient stated that water for domestic purposes was obtained from the artesian well which supplies the Burma Railways. His diet consisted of milk and vegetables only. A mixture containing potassium iodide was prescribed. On 6th October a sample of urine was sent to the Chemical Examiner to the Government of Burma for testing for the presence of lead. The report received on 31st October showed the presence of lead. Meanwhile the symptoms abated fairly quickly and the patient was discharged from the hospital on 9th October. Enquiries were continued and it was discovered that the patient's cook had not been getting the water from the artesian well but from the hospital well nearby for some days prior to his last attack.

A sample of water from this well was sent to the chemical examiner but the report showed it to be lead-free. Though the patient suffered from lead poisoning in 1934 it was thought that the interval of remission of symptoms, lasting for over one and a half years, was too long to render it likely that the old trouble had recurred from re-mobilization of lead from the storehouses in the system.

The enquiry was now directed to the cooking utensils. It was discovered that the patient had bought three cooking pots made of yellow metal, probably brass or copper. Before taking them into use, as is customary in India and Burma, they were lined inside with a white metal normally used for the purpose. These utensils were put into use from the second week of April 1936. One of these was reserved for boiling milk, the major portion of which was consumed by the patient at night, before going to bed. The next consumer was the patient's son aged 11 years who occasionally complained of pain in his wrist. The boy was examined but nothing abnormal was discovered. There was another set of three cooking pots, lined locally during the month of September. I sent the patient to enquire from the persons who lined the pots what they used for the purpose. It was found that they used some white metal or alloy. This substance was used exclusively when the clients pay four annas for a pot, whereas some lead was mixed with this metal in which case the charges were less. The cheapest rate was one anna a pot and very little metal was used. It was admitted that lead was used for the lining of the pots taken



by the patient's cook. Attempts were made to get samples of the white metal and lead pieces for analysis, but these were unsuccessful.

On examining the pots it was found that the lining, which was renewed in September, had practically disappeared within a couple of weeks, whereas it was stated that if the lining material were pure it should have lasted for a much longer period. Milk boiled in one of the pots showed traces of lead. Thus the source of lead in the present case of poisoning was traced to the lining material of the cooking utensils. Milk cooked in one of the pots sent to the chemical examiner (about a month later) on 20th November, 1936, showed no lead, indicating how quickly the lead had been removed by the cooking. Since discharge from hospital the patient had been using aluminium utensils and there had been no recurrence of the symptoms. The urine of both the patient and his son were sent to the chemical examiner on 12th December when no lead was found.

During the first week of February I happened to be in Rangoon and took the opportunity of looking for persons engaged in the occupation of lining brass pots. I found one and after some persuasion he sold me pieces of metal he considered the pure metal used for the lining and another piece which he used in varying proportions when the work had to be done cheaply. The first had a bright silvery appearance, it was difficult to break and did not leave a stain on rubbing it on paper. The second sample was a grey and it marked paper. They were sent to the chemical examiner who reported that the first consisted of pure tin and the latter of commercial lead.

In retrospect one may review the case. The patient had suffered from several attacks of intestinal inflammation including that due to lead poisoning.

In March 1936 he bought new metal cooking pots and, having got them lined, used them from April. In May attacks of colic, abdominal distension and diarrhoea began and these became worse in June. He recovered from the attack, possibly because the lead from the lining had been removed and he had by then excreted the poison from his system. The symptoms recurred with greater severity about the end of September. He then had been using the newly-lined cooking pots for a couple of weeks or so. This time the attack was acute and his admission into hospital apparently saved him from a much worse attack. From the fact that when the patient left the hospital there was little left of the lining of the pots it could be surmised that a large portion must have become dissolved in the articles cooked within a couple of weeks of beginning to use these pots—hence the acuteness and the severity of the symptoms. The fact that the patient was living largely on milk probably prevented him from suffering complications as he was unwittingly administering to himself the antidote with the poison.

#### *A public health problem*

From the standpoint of public health this case presents important features. The use of copper or brass utensils for cooking purposes is common in India and Burma. Though aluminium *dekchies* are slowly replacing them they are still being used in large numbers. Before being put into use they are lined inside with what has been discovered to be tin. This gets absorbed or removed in time and the utensils have to be re-lined periodically. The way in which it is done is as follows:—The persons carrying on this occupation in Burma are Indians. When a pot is given for lining it is thoroughly cleaned by scrubbing the inside with straw and sand or a mixture of sand and earth collected on the road side. If the pot is small this process is done by hand. Water is sprayed inside the pot off and on during the scrubbing. Sometimes small bricks are used to scrape the resistant areas. If the pot is large the process is facilitated by making a small pit in the ground into which the bottom of the pot is securely fitted. The cleaning process is then done by a series of to-and-fro circular movements by the feet—the operator in the meanwhile standing inside the pot. After the old lining has been thoroughly removed the pot is rinsed with water and dried. The outside of the pot is rubbed with a paste of mud. I believe this is applied to prevent the surface from being smoked in the process of lining. A fire is made, preferably in an underground stove, with a hand bellows to keep the fire up. When the pot is absolutely dry and sufficiently hot a piece of the metal (tin) is thrown into it and applied thoroughly by rubbing with a piece of tow or cotton-wool whilst the pot is turned round and round with the other hand. The finishing touches are made by rubbing a piece of tin on to any thin or bare patch and rubbing it over with the cloth. The idea behind the lining appears to be two-fold. It enables the inside of the utensil to be kept clean and polished white. It also protects the metal of which the pot is made from being eroded by the material cooked which in several Indian and Burmese dishes contain very acid ingredients. In some cases the pot liners renew the lining cheaply by substituting lead for the more expensive tin or they adulterate the latter with varying proportions of lead. The consequences can easily be imagined. That cases of lead poisoning are not more frequently discovered is probably due to the fact that few patients consult medical practitioners and even when they do so the symptoms of chronic lead poisoning are so vague that the idea of lead poisoning is unlikely to enter the practitioners' mind.

Some years ago the question of the toxicity of aluminium cooking utensils came to the public notice and as aluminium utensils are greatly used in Burma and these are being locally manufactured I have been on the lookout for likely cases of poisoning by this metal,

but so far have been unsuccessful in diagnosing a particular case of poisoning from this cause. The general opinion (Oates, 1932) appears to be that the use of aluminium utensils is practically innocuous. Such cannot be said of any utensil containing lead. Legislation might be effected, prohibiting the use of lead and lead compounds for lining the brass or copper pots used for cooking purposes. An investigation might be made to determine the seriousness of the problem by seeking for cases of accidental lead poisoning from this source. Investigations might also be made as to whether any particular type of cooking dissolves the lead used in the lining. The enquiry might be extended to find out if the tin used in the lining has any toxic or therapeutic effect on the system. It would be interesting to discover whether the men employed in the occupation of lining the pots suffer from the effects of lead absorption from handling the metal and by the inhalation of the fumes that come out in the process of applying the metal to the utensil on the fire. It may be noted that strong fumes are produced and they are regarded by the Burmese people as being injurious to the health.

#### Comment

The question of the prophylaxis of industrial diseases in India and Burma is not yet properly established on an up-to-date basis. With regard to lead poisoning, no systematic study has been made of its incidence and prevention as an occupational disease. This is partly due to the fact that the industrial and commercial development of this country has been of very recent origin and so there have only been a few occupations in which lead poisoning could occur. So far, no cases appear to have been reported from these sources. We seem to be living in ignorance as to the causes of accidental lead poisoning, which is probably much more frequent than is realized.

#### Summary

A case of lead poisoning is described in which the poison was apparently absorbed with the food cooked in copper or brass utensils which had been lined inside with tin and lead. The process of lining the pot is described in detail. The danger of using such utensils is stressed.

It is suggested that an organized inquiry might be held into the question of lead poisoning of the workmen engaged in lining these pots and also of the persons who use them for cooking. It is possible that legislation might be found advisable to prevent such poisoning.

My thanks are due to U Chit Thoun, Chemical Examiner to the Government of Burma, for the numerous tests he has performed on my behalf.

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## THE CHEMISTRY OF CALCIUM IN TUBERCULOSIS\*

By S. K. SEN, M.B.

Visiting Physician, Silver Jubilee Tuberculosis Hospital and Ramkrishna Mission Free Tuberculosis Clinic, Delhi

### Metabolism

#### Demineralization, Decalcification

THERE is a generally accepted hypothesis, warmly supported by the French authors, that demineralization is a common feature in tuberculosis. Much attention has been given to this subject by clinicians as well as biochemists. Attempts have been made to 'remineralize' the patient in order to make good the loss. Sergent, who reviews the early French work, was quite convinced of the value of calcium therapy.

As early as 1877 Senator based the hypothesis of demineralization on the finding that calcium is excreted excessively by the urine in tuberculosis. There were others who supposed that the calcium loss was due to intestinal tuberculosis; while some believed that it is the result of binding of the calcium with toxic products of the tuberculous lesion.

But the fallacy was not found out by the early writers. In the early days of clinical chemistry the data were obtained mostly by the analysis of urine, without calculation of the total intake of inorganic salts, or estimation of the faecal excretion. To base principles of pathology on such evidence was therefore not only inaccurate but unreliable.

Ott in 1903 was probably the first to study on scientific lines the mineral metabolism in tuberculosis. He calculated not only the total output of minerals, but the total intake also. In his series of pulmonary tuberculosis there was not only no loss, but a plus balance of calcium and magnesium in all cases. In Maver's series of phthisis there was always an increase of calcium excretion in urine characterized by a decrease in the faeces so that, in all his cases, there was a small plus balance of calcium.

Besides these metabolism studies by Ott, Maver and others, tissue analysis of Steinitz shows that there occurs no deficiency of minerals in the tissues of tuberculous animals.

Cantarow (1931) laid much stress on the diffusibility of serum calcium in pulmonary tuberculosis. His findings were that in the active exudative state the diffusibility is greater than in the productive and proliferative type.

According to Krijewsky, serum calcium is higher in tuberculous pregnant women than in normal pregnancy.

Halverson *et al.* (1917) point out that the value of serum calcium depends mainly on nourishment. With adequate nourishment there

\* Read at the Scientific Meeting of the Delhi Medical Association on 28th September, 1937.

is no difference in serum calcium between tuberculous and healthy subjects. With undernourishment there is of course loss not only of calcium, but of every other inorganic salt, *viz*, magnesium, potassium, phosphorus, etc. Demineralization in undernourished tuberculous patients is in no way different from that occurring in malnutrition and cachexia of whatever origin.

Voorhæve therefore studied the quantity of calcium that he supplied in the food both to tuberculous and healthy subjects just sufficient to maintain the calcium balance in the serum. He found that the tuberculous needed no more calcium than the healthy person in order to maintain his blood calcium at the normal level.

Then again, Labbé made a comparative study of faecal and urinary excretion of calcium and magnesium in tuberculous and normal persons on a fixed diet. The total amount of elimination in twenty-four hours was not found to be greater in tuberculous than in normal persons. Excepting in destructive bone lesions, where there is hypercalcaemia with an increase in urinary calcium, his figures show little or no difference (Barkus, 1924). In view of this experimental evidence it may be said that the old theory of demineralization has not stood the test of time. Modern biochemistry has failed to substantiate the idea of hypocalcaemia in pulmonary tuberculosis except in those cases complicated with intestinal lesions and diarrhoea.

*Administration of calcium and its effect on blood and tissues.*—Since calcified tubercles in man are usually healed foci (but in bovine cases they are not always so), calcium has been administered to stimulate calcification and thus cause healing. But the question is—does calcification cause healing or does it follow healing? Up to the present we have no evidence to prove that calcification causes healing. As a matter of fact, calcification in a particular focus commences *after* it has become quiescent.

Then again the question remains as to whether the administration of calcium in any form or by any route favours calcification.

The resistance of workers in lime kilns to tuberculosis is well known. But whether the inhaled lime dust is deposited in the tubercles or it mechanically stimulates fibrosis is not known.

Giving 6 grammes of calcium lactate per mouth for 10 days to normal persons Denis and Minot (1920) did not find any increase in blood calcium. Sieburg likewise found in healthy man that intravenous injection of calcium salts in sufficient quantities to raise the blood calcium to double its value was followed by return to normal in less than half an hour. It is presumed that normally the blood calcium remains at the saturation point, that is to say, up to the maximum amount that the blood can carry. Much of the calcium therefore, when given per mouth, is excreted by the bowels. Any

amount appreciatively raising the blood calcium level beyond normal will not even be absorbed from the bowels.

Maver and his co-worker (1923) were not satisfied with estimation of blood calcium only. They analysed the tissues as well to find out their calcium content. By their experiments they went deeper into the question. The results are briefly given below :

(1) Analysis of the different tissues, spleen, liver, lymph nodes, etc., and the entire body as a whole, excepting the skin, of normal guinea-pigs fed on usual laboratory diet without addition of extra calcium, shows that, although there are individual variations of the calcium content of the different organs of the same animal and of the same organs of different animals, the average is the same. They also found that the calcium value of the tissues is the same as the value for blood calcium, *i.e.*, 10 to 12 mgm. per 100 gm. of moist weight.

(2) Addition of calcium to the usual diet did not increase the value of tissue calcium in normal guinea-pigs.

(3) Experiments on one set of tuberculous guinea-pigs fed on the usual laboratory diet and on another set fed on the usual diet plus calcium showed that the calcium content of the unaffected organs, heart, kidney, muscles, etc., was normal, that is, was the same as the contents of the same organs of healthy animals, whether or not extra calcium was added to the food. But the calcium content of the affected organs, spleen and lymph nodes, etc., was greater than in the healthy organs of even those animals which were not given extra calcium.

When a tuberculous lesion was artificially produced in one of the testicles of a healthy guinea-pig the affected one gave greater calcium value than its healthy mate, no matter whether the animal was receiving calcium or not.

These experiments conclusively prove that the deposition of calcium in the tuberculous tissue does not depend on excessive administration of calcium. So long as the nourishment contains an adequate amount no extra calcium is needed.

*The phenomenon of calcification.*—There seems to be the universal rule that necrotic tissue or any non-living permeable material, whether dead tissue, avascular connective tissue or foreign bodies, such as silk sutures, gauze drains, etc., which cannot be absorbed, is covered by deposits of calcium salts. Why calcium should be deposited on unabsorbable dead tissue or foreign substance is not clearly known, but it is known that calcification, as it occurs in tuberculous foci, does not differ from calcification in any other non-tuberculous tissue. Whether calcification of tubercle takes place according to this universal rule or whether it is a special process, governed by special agents, is not known.

*The theories of calcification.*—Numerous attempts have been made to find out the cause

of calcification. The following are the theories advanced :—

- (1) Theory of chemical action.
- (2) Theory of physical attraction.

*The chemical theory.*—According to this theory the whole process of calcification is the result of chemical action. Such chemical substances are formed in the necrotic tuberculous tissue as are capable of precipitating calcium salts out of the blood. Klotz has suggested that fatty acids are the principal chemical substances. According to Klotz, fatty acids formed in disintegrating tissue precipitate the serum calcium as calcium soaps, which are then transformed into calcium phosphate. But although it is true that fatty changes sometimes take place in the disintegrating tissues, which subsequently undergo calcification, the presence of calcium soaps has not yet been proved. So long as specific micro-chemical tests are not discovered conclusive proof will not be possible. Further, calcium soaps in a colloidal matrix are almost completely absorbed, only one or two per cent are changed into inorganic salt. Moreover, calcification may occur in those tissues which do not undergo degeneration at all. Pathological calcification has been found to occur under the same condition as normal ossification where no fatty degeneration ever took place. Modern workers point out that calcium salts are deposited in exactly the same state as they exist in the blood, and not as soaps or any other transitional state (Pryde, 1931).

There is another group of believers in the chemical theory who suggest that calcium salts are held in the blood either in solution as carbonate and phosphate or are held in colloidal suspension by the protein as calcium-ion-protein compound, or both. This solution or suspension is in an unstable condition. Increased alkalinity of the blood or changes in the protein or  $\text{CO}_2$  content cause the calcium to be thrown out.

*The theory of physical attraction.*—The sponsors of this theory hold that calcium is deposited rather by physical attraction than chemical action. Calcium is found to be deposited on hyaline and colloidal masses of whatever chemical composition. Since tubercles present these physical conditions they undergo calcification. Calcification does not depend on any particular chemical constituent of the tissue.

*The chemical composition of calcified deposits.*—The chemical composition and even the proportions of the inorganic salts in the calcified areas of the body are practically identical, whether the calcification occurs in normal condition such as in ossification or in pathological condition such as in tuberculosis. Calcium salts occur as carbonate and phosphate and the magnesium salt as phosphate.

But before examining the results of analysis of calcified tubercles, the following facts should be taken into consideration. Most of the

analyses that were published were carried out by the ashing process. In the ashing process phosphates and carbonates are formed from the tissue. Therefore, according to their proportions and the temperature, these may convert the calcium salts into phosphate and carbonate (Wells, 1920).

Wells therefore used a wet extraction process of analysis which eliminates this source of error. His figures are these (Maver *et al.*, 1922):—

$\text{CaCO}_3$  in human tuberculosis = 10.1. In normal ossification it is equal to 9.2 or 10.1.  $\text{Ca}_3(\text{PO}_4)_2$  in human tuberculosis = 87.8. In normal ossification it is equal to 83.8 to 87.8. It will be noted from these figures that using even the wet method, which excludes the fallacies of the ashing process of analysis, Maver and Wells found that the calcium content of tubercles was the same as that of bone.

Then again, using *x-ray spectrogram*, Funaoka of Kyoto University, Japan, found that the calcium of tubercles is in the same form as in healthy bone, chiefly  $\text{Ca}_3(\text{PO}_4)_2$ .

Like other calcified regions the calcified tubercles may eventually be transformed into true bone, with Haversian system and even with typical functioning marrow. But owing to its extreme avascularity this transformation occurs but seldom.

*The coagulation of blood in tuberculosis and effect of calcium upon it.*—The amount of fibrinogen of the blood is increased in tuberculosis varying directly with the acuteness of the disease, yet the coagulation time does not deviate from normal. Gram, Addis, Sweany and others found no significant change in their cases. Some observers have found slight shortening of time; but it may have been due to the fact that tuberculous patients are generally given excessive milk in their diet, which contains sufficient calcium.

The coagulation time is however appreciably shortened after a large hæmorrhage. This is perhaps nature's attempt to stop the hæmorrhage by clotting.

Administration of calcium shortens the coagulation time.

*Calcium therapy in tuberculosis.*—From time immemorial calcium has been looked upon as an indispensable drug in the treatment of tuberculosis. So far as one can understand, the reputation of calcium rests on the following supposed facts :—

- (1) Calcium induces calcification.
  - (2) Calcium administration makes good the loss caused by decalcification.
  - (3) Calcium stimulates connective tissue formation.
  - (4) Calcium helps to stop hæmorrhage.
  - (5) Calcium has a positive chemotactic effect on the leucocytes.
  - (6) Calcium has a checking effect on diarrhoea and exudative process.
  - (7) Empirical use.
- Let me now deal with these points one by one.

*Calcium induces calcification.*—In the foregoing portion I have shown that the process of calcification is not at all influenced by administration of calcium. It depends solely upon one particular condition, *viz.*, how long the tubercle remains a quiescent mass of colloidal organic matter presenting such favourable properties as to attract the deposition of calcium. It has also been pointed out that calcification does not take place so long as the disease is active in the tubercle.

*Calcium makes good the loss caused by decalcification.*—I have already endeavoured to prove that no decalcification occurs in tuberculosis. According to the experimental data obtained up to the present, the theory of decalcification is a wrong hypothesis based on inaccurate deduction derived from insufficient observation. Then, again, administration of calcium, in whatever form or by whatever route, raises the blood calcium but momentarily—not more than a few hours. So long as the patient gets sufficient calcium in his nourishment, his blood and tissue calcium remains steady at the normal level. As pure cow's milk contains about 2 grammes of calcium per litre, drinking of pure milk up to the limit of digestion is more than enough to supply the required quantity of calcium.

*Calcium stimulates healing by connective tissue formation.*—Since inhalation of dust, which contains silica, stimulates connective tissue formation in the lung, some authors have supported the idea that calcium also stimulates connective tissue. But as pointed out already tuberculous tissue does not lack in calcium, nor is there any evidence to prove that connective tissue grows more in calcium-treated animals. In a series of tuberculous guinea-pigs fed with calcium there was no evidence that fibroblastic healing reactions were greater than in the control animals which were not given calcium.

*Calcium helps to stop hæmorrhage.*—In the case of hæmorrhage, however, large doses of calcium are urgently required. Besides other methods, injections of calcium in conjunction with parathyroid hormone, if possible, are indispensable. 'Parathormone' is an effective parathyroid hormone available on the market.

*Calcium has a positive chemotactic effect on leucocytes.*—Pauline Wolf observed (1921) that increase in the blood calcium or calcium in the tissue could affect the action of leucocytes in a tuberculous lesion. Injection of calcium also raises the proportion of polymorphonuclear leucocytes. But how this takes place is not clear.

*Calcium has a checking effect on diarrhœa and exudative process.*—It is a common experience of clinicians that a persistent diarrhœa in tuberculosis, particularly of toxic origin, is usually brought under control by injections of calcium. Brown and Sampson (1926) have advocated liberal injections of calcium, preferably intravenously, in toxic diarrhœa. Ringer and Minor (1922) also recommended the use

of calcium to check diarrhœa. Calcium is also used to diminish the pleural and pulmonary exudation. But calcium is not known to check these exudative processes by its specific action on the tubercle bacillus or by any influence on the tuberculous lesion. Its action may be compared to its effect on coagulation in hæmoptysis.

*Empirical use.*—I have already mentioned that for some reason or the other calcium has come to be used in the treatment of tuberculosis. I have tried to show that the improved laboratory technique of modern biochemistry and the experimental data obtained have failed up till now to lend any support to the general belief and ideas about the metabolism of calcium in health and disease. Consequently, the fundamental basis of calcium therapy needs overhauling.

But leaving the laboratory findings aside, in actual practice, the fact remains that calcium does give clinical benefit. It is for this clinical benefit that calcium has been universally accepted as almost an indispensable drug in the treatment of tuberculosis. Although no specific action of calcium has yet been discovered still the patient improves. It is the everyday experience of the physician that calcium, in many cases, not only checks the exudative process, but even lowers the toxicity. The fever comes down, diarrhœa if toxic and pleural exudate become less and less, appetite and even the general feeling of well-being improve. I have often found intelligent and educated patients pinning their faith on calcium. On many occasions when I proposed to stop calcium they insisted on having it.

### Conclusion

In conclusion it should only be said that even if we cannot explain such clinical results and cannot reproduce them in experimental animals the value of calcium should not be underestimated. It should be freely admitted that when the experience of the clinicians endorses the use of calcium, as giving definite clinical benefit, we must listen with respect to this endorsement.

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## THE RELATION OF SYSTEMIC BLOOD PRESSURE TO INTRA-OCULAR PRESSURE

By J. N. JASWAL, M.B., B.S., D.O.M.S. (Eng.)  
Provincial Medical Service, United Provinces

MUCH controversy still exists as to the relation between the arterial blood pressure and the intra-ocular pressure. The consensus of opinion would appear to be that experimental investigation has established the existence of a distinct relationship under ordinary conditions between the systemic blood pressure and the intra-ocular pressure, whether it is so or not can better be judged by my observations (see table). Some of the current views relating to the topic are summarized as follows:—

(1) High intra-ocular pressure depends upon high capillary pressure, which in turn depends upon low blood pressure.

(2) Hyperpietic diathesis will predispose to an acute glaucomatous crisis in the eye.

(3) Glaucoma is associated with diseases of the arterial system.

(4) Venous pressure in its variations is more closely connected with the intra-ocular pressure.

(5) Independent activity of capillary circulation depends upon physical, chemical, hormonal and psychical influences, viz, emotional, temperamental, endocrine disturbances and sympathetic involvement.

The cases, 68 in number quoted in the table, were all definitely glaucomatous. The blood pressure of the brachial artery was taken by means of the mercury sphygmomanometer by the auscultatory method, the patient being in the recumbent posture. The conclusions drawn from the data depend upon the arithmetic means of the various readings:—

(1) In the normal individual the pressure as registered in the brachial artery is: systolic 110-125 mm. of mercury, diastolic 60-80 mm. of mercury.

(2) Glaucomatous patients are usually of advanced age and we should ordinarily expect higher blood pressure than the above normal average.

(3) The average systolic pressure of 68 glaucoma cases is 130.5 mm. of mercury and the average diastolic pressure of 26 cases is 81 mm. of mercury; the highest systolic being 190 and the lowest 80 and the highest diastolic 130 and the lowest 50.

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(4) Many cases of high intra-ocular tension are associated with low blood pressure and *vice versa*.

Opinions of other authors: Craggs and Taylor found a number of subjects whose systemic blood pressure (brachial) was between 180 and 208 mm. of mercury yet who presented a normal ocular tension, and who had no signs or symptoms of glaucoma. On the other hand, they observed a number of cases of glaucoma with very high ocular tension (70- to 80 mm. of mercury) who nevertheless had normal blood pressure according to their ages. They conclude that high arterial tension is not a necessity and apparently not even a leading factor in the ætiology of glaucoma. Lobo, discussing the 'inflammatory glaucoma' of the tropics, emphasized the fact that arteriosclerosis does not play an important part in its ætiology. H. Sattler too is included amongst those who have not found a higher average blood pressure amongst the glaucomatous than amongst the non-glaucomatous persons of the same age.

There are a few authors who cautiously assume that glaucoma, a disease which is characterized by an increase of the intra-ocular tension, is dependent upon an increase of blood pressure; that, however, there is any connection between the two is denied by so high an authority as Priestley Smith. Calhoun in his article on 'Vascular state and glaucoma' has quoted Charlin's observations that 90 per cent

Table showing systolic arterial blood pressure and diastolic blood pressure of the brachial artery of patients suffering from primary glaucoma

Blood pressure in mm. of Hg.	Systolic pressure	Diastolic pressure
50	..	1
60	..	3
70	..	4
75	..	4
80	1	5
85	..	1
90	1	2
95	..	2
100	4	1
105	1	..
110	7	2
120	11	..
125	8	..
128	1	..
130	12	1
135	2	..
140	6	..
145	2	..
150	3	..
160	3	..
180	5	..
190	1	..
TOTAL NUMBER	68	26

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## TRANSPLANTATION OF URETERS INTO THE PELVIC COLON\*

By K. V. RAMANA RAO

LIEUTENANT-COLONEL, I.M.S.

District Medical Officer, Kistna, Masulipatam

TRANSPLANTATION of ureters into some part of the body outside the bladder has been practised for a long time for certain pathological conditions. These conditions may be broadly divided into three groups—those occurring in (1) the bladder, (2) the ureter, and (3) outside these two organs.

(1) The conditions in the bladder which require disconnecting the ureters from the bladder and implanting them somewhere else are:—

### *Congenital malformations:—*

*Ectopia vesicae* where there is an arrest of development of the lower part of the abdominal wall and the anterior wall of the bladder, along with the symphysis pubis. The posterior wall of the bladder being unsupported in front, protrudes through the gap in the anterior wall, and thus this condition is also known as extroversion of the bladder.

There is another rare condition to which a well-known Edinburgh surgeon gave the name epispadias in a woman. I have seen only one case of this kind, which was demonstrated by the surgeon mentioned above. In this case, the roof of the urethra and the lower portion of the symphysis pubis were undeveloped and the bladder opened directly into the vulva without any intervening sphincter, so that there was constant dribbling of urine.

\* Being a paper read before the anniversary meeting of the District Medical Association, West Godavari District, Ellore, on 9th March, 1935.

(Continued from previous page)

of glaucoma cases show vascular symptoms. His own conclusions are that vascular disease was present in 95 per cent of cases and that abnormally high systolic pressure was present in 42 per cent and high diastolic in 53 per cent. Dilatation of heart or aorta was present in 60 per cent. The intra-ocular pressure is, of course, dependent upon the maintenance of the blood pressure, and it is quite easy to demonstrate, by pressure upon the carotid artery in man, that the pressure inside the eye can be temporarily reduced by this means by about 40 per cent; but it has been made clear that there is no relation between a high systolic pressure in the brachial artery and glaucoma. Blood pressure of 50 patients suffering from primary glaucoma whose average age was 56 was 157 mm. which cannot be considered excessive for patients of this age (Foster Moore).

**Conclusion.**—High arterial blood pressure is neither an essential nor an important factor in the aetiology of glaucoma.

*Injuries to the bladder:*—The commonest injury to the bladder occurs in woman during difficult and prolonged parturition when the anterior wall of the vagina and the inferior wall of the bladder slough away due to extreme and long-continued pressure of the head of the child against the under surface of symphysis pubis, thus forming what is known as vesico-vaginal fistula.

In the above three conditions, the bladder wall or the sphincter being deficient, the urine dribbles away constantly outside, thus making the life of the patient a misery. If the defect is too big or in any way unsuitable for plastic operation to close it, the urine must be diverted from the bladder so that it can be evacuated in a more convenient manner.

*New growths of the bladder*, either benign or malignant, which require extensive removal of the bladder or which involve the ureters also. In these cases, the bladder being entirely or extensively removed, the ureters must be transplanted somewhere else.

### *Advanced tuberculosis of the bladder.*

(2) The conditions in the ureter which require transplantation are:—

*Congenital malformations.* Cases rarely occur in which one or both the ureters open into the vagina or the urethra. If it is not possible to transplant them back into the bladder, they will have to be transplanted into the pelvic colon.

*Inflammatory conditions* in or around the ureter in which there is extensive destruction of a portion of the ureter, preventing uretero-ureteral anastomosis.

New growths, though rare, may sometimes be met with requiring extensive removal of a portion of the ureter and transplantation of the remaining portion into the pelvic colon.

(3) Conditions outside the bladder or ureter which require transplantation are new growths of the pelvis or abdomen involving the ureter in which, owing to either obstruction due to pressure or extensive removal of the ureter along with the tumour, the urine has to be diverted into the bowels.

Of all the conditions mentioned above vesico-vaginal fistula is the commonest in India and in other countries, which requires this operation. In nearly 90 per cent of these cases, the fistula can be closed by plastic operation but a few cases occasionally occur where the destruction of the tissue is too extensive to be closed satisfactorily, where there is too much scar tissue, or where the opening is too near the neck of the bladder under the symphysis pubis in which cases satisfactory closure cannot always be obtained. If the bladder is properly emptied periodically during these prolonged difficult labours, the labour itself may be hastened and, if any fistula is going to form it would form nearer the base of the bladder, in which case, the closure of the fistula by plastic operation,

will be easier and more satisfactory. But if the bladder is not emptied and urine is allowed to accumulate in it, it not only prolongs the labour but also the area of the bladder nearer its neck will be subject to great pressure and the fistula thus formed will be very near the symphysis pubis sometimes involving the beginning of the urethra also and plastic operations for closing such a fistula will not be satisfactory, and recurrences are very liable to occur requiring some other operation to divert the urine from the bladder.

*History.*—Many attempts have been made to transplant the ureters into different parts of the body. At first the ureter with a small portion of the bladder was implanted into the rectum but almost every case proved fatal on account of ascending infection. On account of this high mortality this procedure was abandoned. Then attempts were made to transplant the ureters on to the skin in the lumbar region and suitable cups were arranged to drain away the urine. But the misery of the patient still being very great attempts were again made to transplant the ureters into the bowels. This time the bladder wall was not included in the transplantation and only the cut end of the ureter was directly implanted into the bowel. This operation also was not satisfactory owing to the almost inevitable ascending infection. Then Stiles devised an operation for oblique implantation so that the union may be stronger. He did the usual direct implantation but buried the ureter for a little distance in the intestinal wall by means of Lembert's sutures. Even this operation did not prevent the ascending infection.

So some other surgeons studied the question carefully and tried to improve on this direct implantation by imitating the passage of the ureter into the bladder. Fowler in the year 1898 transplanted the ureters into the rectum by making the ureter lie between the muscular coat and the mucous membrane of the rectum for some distance. He also made a flap-valve of the rectal mucous membrane over the end of the transplanted ureter so that the end of the ureter did not come in contact with the descending faeces.

In 1911 Coffey improved on this operation by transplanting the ureters obliquely into the bowel by making the ureter lie for a distance between the muscular and mucous coats of the pelvic colon. This operation has been found very successful and the danger of ascending infection was greatly minimized. With a few minor modifications by individual surgeons this operation is widely performed now.

Originally both the ureters were transplanted at the same time but this procedure proved fatal in some cases though the urine was carefully tested previously and found to be absolutely free of any infection. It was found that these patients died of uræmia on account of traumatic anuria. On account of the cutting of the ureter and other manipulations

required in transplanting them, the kidneys suddenly stopped secreting, from these reflex causes. The kidneys would have recovered from the shock in about 24 or 48 hours and started secreting urine again but sometimes the patient died before the secretion was re-established. So, the operation was divided into two stages, one ureter, generally the left, being implanted first and then after an interval of about two or three weeks the second ureter was also implanted. By this procedure, though there was traumatic anuria of one kidney in some cases, the other kidney took on the functions and secreted more urine, thus tiding over the patient, for the critical period. Then when the second ureter was implanted the first kidney was fully recovered and properly functioning. This operation is practically always successful and fatal cases are rare. I personally think that it is always risky to transplant both ureters at the same sitting, even if all precautions are taken to see that the kidneys are quite healthy previously and all chances of infection are prevented, though some cases may prove to be successful.

*Surgical anatomy.*—The relations of the ureter should be properly known before attempts are made to transplant it. The ureter is about 12 inches long. Its narrowest point is about 2½ inches below the hilum of the kidney where its diameter is about one-eighth of an inch. The ureter has another narrow point where it passes over the brim of the pelvis. The ureters are lined by a thin mucous membrane which is thrown into folds. It has a fairly thick muscular and a thin but elastic external fibrous coat.

The ureter lies loosely in the post-peritoneal connective tissue. In the abdomen it lies upon the front of the psoas muscle and about half-way between the hilum of the kidney and the brim of the pelvis, it crosses in front of the genito-crural nerve. The portion above the genito-crural nerve is in direct contact with the peritoneum, except on the right side near its commencement, where it lies behind the third part of the duodenum. The lower half of the abdominal portion of the ureter is separated from the peritoneum by the spermatic or ovarian blood vessels. At the brim of the pelvis the relation of the ureter to the large vessels is not very constant but it is very important as it helps to find the ureter easily. The ureter generally passes over the bifurcation of the common iliac artery or sometimes it may be a little external to this, passing over the external iliac artery. In the lower half, the ureter lies to a little extent behind the commencement of the rectum on the left side and the termination of ileum on the right side. All these points must be clearly borne in mind before attempts are made to transplant the ureters.

*The operation.*—After proper preparation of the patient with complete rest in bed, mild nourishing diet and urinary antiseptics and

after washing out the rectum twice with boric lotion the operation is performed. A longitudinal incision, about half an inch to one side of the middle line, is made commencing from about the level of the umbilicus and ending about an inch above the pelvic brim. After the abdominal cavity has been opened, the patient is put in the Trendelenburg position and the small intestines are kept away from the field of operation by suitable abdominal swabs. The pelvic colon is recognized and a suitable portion of it is selected for implantation. Then the pelvic colon is also kept away from the field of operation. The abdominal aorta is recognized and traced down to its bifurcation. Then the common iliac artery is traced to its bifurcation and this point is carefully noted. An incision is made in the posterior peritoneum longitudinally for about two inches, in a line with the bifurcation of the common iliac artery and commencing about half an inch above it. The peritoneum is picked up with forceps, and carefully snipped with a pair of blunt-pointed scissors so that the underlying ureter may not be injured. If this opening in the peritoneum is carefully widened without disturbing the posterior structures, the ureter can generally be found lying just behind the incision in the peritoneum. The search for the ureter must always be made in the line of the bifurcation of the common iliac artery or just external to it. After the ureter has been recognized it should be carefully lifted from the posterior wall of the abdomen and freed from its surrounding loose connective tissue. Then the ureter is ligatured with thick catgut or silk at the lower end of the opening in the peritoneum and cut through a little obliquely. The upper portion of the loose ureter must be lifted up and kinked a little so that the urine may not escape from the cut end. Then the opening in the peritoneum should be closed with fine catgut behind the ureter. A fine catgut suture should be passed through the conical end of the cut ureter and tied there leaving about an inch of the catgut at one end of the knot and the other end along with the needle attached to it. The piece of catgut left behind should be threaded into the eye of a probe which should be passed into the ureter carrying the piece of catgut with it. The catgut will be released automatically when the probe passes into the ureter and then the probe can be removed leaving the inch of catgut inside the ureter. The pelvic colon is now brought near to the ureter and an incision about  $1\frac{1}{2}$  inches long is made into one of its free longitudinal bands. This incision is in the muscular coat only and does not cut the mucous membrane. The muscular coat is gently separated from the mucous membrane for a little distance on either side to allow the ureter to lie comfortably. Then five or six pieces of catgut are passed through the two cut portions of the muscular coat but excluding the mucous membrane. The middle portions of these

sutures are lifted up by means of a probe and the ureter, with its attached catgut and needle, is placed underneath these sutures above the mucous membrane. At the lower end of this incision a small slit is made in the mucous membrane to allow the ureter to pass through freely into the lumen of the gut. The needle attached to the catgut at the end of the ureter is passed through this slit into the gut and brought up again through the whole thickness of the bowel about a quarter of an inch below the lower end of the incision. The needle is brought out and the catgut pulls the end of the ureter into the lumen of the gut through the slit in the mucous membrane. The ureter is fixed in this position by tying the catgut near the lower end of the incision. Then this catgut is cut away and removed. The six sutures passed through the muscular coat of the colon are tied over the ureter bringing it between the muscular and mucous coats. About six more Lembert's sutures are placed burying the first line of sutures. This completes the transplantation and the abdominal wall is closed in the usual way.

*After-treatment.*—The after-treatment consists in keeping the patient in Fowler's position and administering urinary antiseptics. The diet should be limited to milk and barley water with a little fruit juice. Generally the convalescence is uneventful and no further treatment is required, except an occasional intravenous injection of iodine. The patient generally complains of diarrhoea but it is not true diarrhoea, it is only the passage of urine in the early stages and it becomes mixed with the faeces after three or four days.

Patients in whom both ureters are transplanted generally have a loose motion every three or four hours day and night, in the beginning. But gradually the rectum becomes accustomed to the presence of urine in it and the patients can regulate the movement of the bowels to four or five motions in the day and only one or two motions at night. After some time they can manage to have a complete night's rest by passing a motion just before going to bed and they do not experience any inconvenience.

In some cases an occasional mild attack of infection may be seen in these patients after indiscretions either in diet or other general habits but this can be controlled easily and quickly by suitable treatment.

I give below brief notes of a case I operated on within the last year:—

This case was operated on by me in the headquarters hospital at Guntur in February 1934. The patient, aged about 30, was admitted into the hospital on the 4th November, 1933. She was delivered in the same hospital four months previously and developed a vesico-vaginal fistula. On examination an opening an inch in diameter was found in the bladder near the symphysis pubis. The urethra did not communicate with the bladder. After proper treatment and rest and the usual examination of blood, urine and faeces, the left ureter was implanted into the pelvic colon on the 8th

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## GUINEA-WORM

By HARBANS SINGH TREWN, M.B., B.S.  
Chief Medical Officer, Banswara State, Banswara

GUINEA-WORM is very prevalent in Banswara and its neighbouring states and it is the cause of much suffering. In the State Hospital during the three years 1933 to 1935, 526 guinea-worms were extracted, almost all of these were from residents of the town of Banswara.

Most of the people of the city of Banswara take water from step-wells locally called *baolis*. People with their pitchers or other vessels go down the steps to the surface of the water and not only fill the vessels with water but also wash their hands and feet there. If the person has a guinea-worm, discharging in the foot, ankle or leg, some of this discharge, which is teeming with actively motile embryos, enters the *baoli* water and infects it. In some localities in the town of Banswara where people take only well water and not *baoli* water the disease is practically absent. Residents of the locality where I reside take water from a *baoli*, which has been converted into a well for some years, and during the last five years I have not seen a single person residing in this locality suffering from this disease. The inmates of the local jail who are in my medical charge also take water from the above source and no guinea-worm has been seen by me among them, although they have been in the jail for more than a year. Guinea-worms have been treated in prisoners during the first year of their stay in the jail, which means that the infection has been acquired before coming into the jail. One prisoner who has been confined for fifteen years recently developed guinea-worm and it is not known how he can have been infected. Several people known to me used to suffer from guinea-worm every year, but on my advice they have now changed from *baoli* to well water and have had no more worms developing.

All persons taking water from the same source do not appear to be equally susceptible. Certain persons enjoy complete immunity from this disease, although they take water from anywhere, whilst others who obtain water from the same sources show heavy infection every year. Before I came to Banswara there was a person

who had 56 guinea-worms at one time on different parts of his body; I have seen a dozen myself. One of my compounders (before changing to well water) used to get guinea-worms every season and had seven in one year, coming one after the other.

*The worm.*—The worm which causes trouble is the female. The usual size of the female worm extracted from human tissues is  $2\frac{1}{2}$  to 3 feet but longer worms are also seen.

*Clinical history.*—Guinea-worms are often seen under the skin, giving no trouble; it is at this time that attempts to extract them prove successful. The usual time for the guinea-worms to make their appearance is the hot weather, especially during the rainy season, that is in this state from the middle of June to the middle of October, but occasionally a worm may be seen as early as March and as late as November.

The guinea-worm usually tries to come out of the body during the rainy season. It may point at the surface of the body in the form of a small 'pimple' and then may come out slowly or be coaxed out by the patient himself by gentle traction applied to it. This is the most fortunate sequel from the patient's point of view, but it is rare for this to occur. It usually happens when guinea-worm appears in the scrotum or in such unusual situations as the tongue. In cases where a guinea-worm is removed so easily there is practically no inflammation around the point where it first emerges.

It may become calcified. This is the next best sequel and it occurs fairly often. A calcified guinea-worm gives no trouble except that its presence can be felt by gently running the fingers over it. The history of such a case is that the guinea-worm has been there for two or three years, that it has not changed its position and it has never caused urticaria or any local inflammation. I have removed successfully one calcified worm in a coiled-up condition from the scrotum and have attempted to remove them from other parts of the body twice, but failed, as the worm was calcified and was very brittle. In such cases it should be left alone.

It may form into a cyst. In this case a painless swelling appears, which is usually tense to the feel, if it is deep below the muscles, or it is soft and fluctuating if superficial under the skin. When superficial it looks like a cold abscess but there is no history of bone disease. The health of the patient is good, an important point for differential diagnosis is that it occurs in parts of the body where guinea-worms are usually found.

The patient will say that he has not noticed the guinea-worm or any of its signs, which has caused this swelling, and often he will add that the swelling has descended from a higher to a lower level. On opening the swelling, thin whitish fluid comes out and along with it a dead guinea-worm will also be found. In one case which occurred on the dorsum of the foot, there

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December. She bore the operation well and the temperature was practically normal the whole time after the operation. The right ureter was transplanted on the 8th January, 1934. She also bore this operation well and there was no rise of temperature afterwards. On the 21st February, the hole in the bladder was closed, leaving a small gap under the pubis to allow the escape of the mucus from the bladder, as the urethra did not communicate with it. She had a slight rise of temperature for two or three days after this operation probably from mild infection of the kidneys. But she recovered quickly and was discharged completely cured on 13th March.

was a lipoma-like mass of fat in the cyst and around this the guinea-worm had partially coiled. The cyst also contained the usual whitish fluid. After incision and evacuation of the contents the healing was remarkably rapid, but in some cases one end of the guinea-worm adheres to structures inside the cyst, when healing is delayed till it is extracted.

Sometimes a guinea-worm is seen and then disappears. It is very difficult to say what has happened to it.

It may have gone deeper and been reabsorbed. It may have gone deep into the muscles and become calcified or it may go deep and then either appear at some other place in the same season or remain quiescent and give trouble next year.

The most usual course of guinea-worm infection is the following:—

After a guinea-worm has been visible for some time, and occasionally without its having been visible at all, a blister is formed at a certain point. The formation of this blister is often accompanied by an attack of urticaria. The attack is usually very severe with very intense itching and a sense of marked depression so that the patient may even fall down. The attack usually passes off quickly, especially if a brisk purgative is administered.

Around the blister an area of redness and inflammation develops, which becomes more and more tender. On snipping the blister a milky fluid is obtained which when diluted with about five times its volume of normal saline and examined under a low power of the microscope shows large numbers of guinea-worm embryos, these are striated and very motile.

The embryos, when they are allowed to die and dry on a slide, are found to have their two ends meeting together. When a blister has been snipped, a fragment of the worm is seen protruding. In this condition an attempt to remove the worm by the aid of incision is both futile and inadvisable. The head end of the worm comes out. Slowly it discharges its milky fluid, especially when in contact with cold water, or in cloudy weather. All the symptoms (described below) are aggravated on a cloudy day.

In a fortunate case the worm is wound round a match-stick or a similar piece of wood, a little every day, till all comes out; but such results are rare, the guinea-worm usually snaps or recedes after forming a fresh blister. In both these cases its highly irritating discharge comes in contact with the tissues and very painful abscesses develop.

The abscess may be single around the point where the blister first formed. It is just like an ordinary abscess except that after incision a guinea-worm is found in it. The guinea-worm may come out after the abscess is opened and be found lying free in the cavity of the abscess, or it may be fixed and what is left of it passes deeper into the muscles; it may now be extracted by careful traction in a day or two, but usually

it cannot be got out. Injections of 1 in 1,000 solution of corrosive sublimate into it may help in pulling it out or they may make it harmless, so that when it breaks nothing untoward occurs, daily injections for two or three days are sufficient for this. If, however, the guinea-worm, untreated with corrosive sublimate solution injections, breaks again it forms an abscess at a deeper level.

Sometimes multiple abscesses develop along the course of a guinea-worm. They are characterized by intense pain, a relatively small amount of pus in each abscess and marked surrounding redness. The abscesses are so painful that the patient cannot move and any movement of the bed or even touching of it causes unbearable pain. He cannot sleep and this tells on his general health. These abscesses are most painful when they occur on the anterior surface of the leg, over the tibia. The abscesses are accompanied with fever. It is curious that the pain in these abscesses appears worse on cloudy days especially in thunderstorms. These abscesses will trouble the patient till the whole of the guinea-worm has been removed.

*Sequelæ.*—(1) Sinuses. These occur occasionally but are cured easily by surgical interference, especially if no remains of the worm are left behind.

(2) Ankylosis of joints. This is very frequent and ankylosis usually occurs in the knee joint in a semiflexed position. This is the joint most commonly affected.

(3) Shortening of the muscles of the calf due to fibrosis, as a sequence of inflammation, is very frequently met with. Patients with ankylosis of a knee and walking with the heel of the other foot drawn up are often seen in guinea-worm endemic areas.

### *Treatment*

*Prophylactic.*—This can be summed up in one sentence—do not take water from a *baoli* (stepwell) or a tank. Many people always boil their drinking water and this is of course the surest way of escaping the disease as it kills both the cyclops and the guinea-worm embryos. Berkefeld filters may be used and they are very efficient.

*Curative. Internal.*—There is no internal or medicinal treatment for guinea-worm. Many fantastic indigenous remedies are tried, such as taking of '*Bhilawa*' (marking nut), a very irritating nut used by dobbies for marking clothes, *asafetida*, old *gur*, etc. People often fast and take only aniseed made into a ball with *gur*, the treatment is for two days and during this time no water is taken. It is said that it has more prophylactic than curative effect.

In the hospital tartar emetic injections (gr. 1 to 10 c.cm.) have been made intravenously, but they cannot abort or prevent an attack of the disease. They may have some beneficial effect on the inflammatory process. The solution must



be quite fresh in distilled water and great care is required during injection as the escape of a single drop into the tissues will cause great pain and inflammation, some people also get vomiting during and after injection.

As I have mentioned above, the only beneficial effect of these injections may be on the inflammatory process; but equally efficacious are intravenous injections of acriflavine in normal saline, 20 c.cm. of 1 in 1,000 solution.

*Local.*—Much can be done to reduce suffering by early local treatment. When the worm is visible under the skin and can be distinctly felt, it should be extracted. If it is not quite visible hot fomentations may be used for a day and then the guinea-worm will come more to the surface; when the worm can be located with certainty in any place but the foot, or in the vicinity of the ankle or knee, an attempt should be made immediately to extract it, otherwise it will migrate lower down to the knee, ankle or foot where its extraction becomes difficult or impossible.

In the hospital guinea-worms are extracted under local anæsthesia. They can be extracted under general anæsthesia which has the advantage over local, that the worm is not obscured by the swelling as in local anæsthesia, but the latter can be used successfully in out-patients.

*Details of operation.*—The area over the worm is shaved and is cleaned with spirit, but no coloured antiseptic such as iodine should be applied. The course of the guinea-worm is now marked with a stick of bamboo dipped in iodine—this is very important as after the injection of fluid the guinea-worm may be lost both to sight and touch; 0.25 per cent novocaine solution to which a few drops of adrenalin (1 in 1,000) have been added is used for anæsthesia.

After the injection an incision is made parallel to and just to one side of the guinea-worm. The skin is then dissected back a little beyond the position of the worm as indicated by the iodine mark, and a fully curved hook or aneurism needle is passed under the worm. The tissue over the worm is peeled off by blunt dissection. It is important to use only a blunt dissector because a sharp one is likely to injure the worm and so bring about escape of embryos and irritating fluids.

When the superficial tissues have been dissected back the worm will be visible like a glistening whitish thread, it will usually raise itself a little into a loop. A curved needle is then passed under the worm and slight traction applied. When sufficient length of worm is drawn out it is lightly caught by the thumb and finger and gently pulled with a slightly jerking movement. Each side of the loop is drawn upon alternately and at the same time the course of the worm is gently massaged.

The worm should be treated with great gentleness, as it will break easily. The operation needs patience because if the worm breaks a painful

lesion is produced which may keep the patient in bed for a long time.

If the worm is not completely extracted on the first day the freed portion is wrapped in a piece of absorbent cotton soaked in 1 in 1,000 solution of mercuric chloride and covered with a piece of water-proof tissue and a bandage. On the following day a further attempt to extract the worm is made, and in some cases this has to be repeated for several days before the whole of it is extracted.

If a part of the worm is just beneath the skin it will not be necessary to mark it with iodine.

### Accidents

(1) The worm has a zig-zag course and some parts of it lie deeper than others, so there is always a possibility of piercing the worm when injecting the anæsthetic, hence one should not thrust the needle too deep.

(2) The worm may be punctured by the needle when the over-lying tissues are being dissected. In the above two cases not much harm results if the worm can be extracted the same day or at least if the punctured part of the worm can be taken out of the wound. From the puncture the uterus of the worm will wriggle out and break in any case as it is so delicate, and the highly irritating discharge teeming with actively motile embryos will escape. The protruded part of uterus should be cut off, 1 in 1,000 solution of mercuric chloride applied to the wound and an attempt made to extract the worm. If it cannot be extracted that day it is dealt with in exactly the same way as an ruptured worm.

(3) The worm may be cut in two. This is a very serious thing as part of the uterus wriggles out and the cut ends of the worm recede deep into the tissues. The uterine wall ruptures and the two ends of the worm will discharge their highly irritant material into the tissues, causing inflammation and abscess formation. As soon as this accident occurs the patient gets an attack of urticaria, which should be treated by a brisk purgative. When this accident occurs an attempt should be made to find the cut ends by enlarging the incision and dissecting more deeply. An attempt to extract the worm from another place may be made, if its course is still visible but when the uterus escapes the worm becomes much harder to see. If the cut ends of the worm can be picked up, 1 in 1,000 solution of mercuric chloride should be injected into each end by an all-glass hypodermic syringe. Several injections are given so as to wash out the embryos. The wound should then be dressed with absorbent wool soaked in mercury lotion and a water-proof covering applied. It is important that the dressings should remain wet as otherwise the exposed part of the worm will become dry and break off.

(Continued at foot of opposite page)



## SPINAL ANÆSTHESIA

By S. A. MALIK, L.M. &amp; S.

*Medical Officer, Latur, Hyderabad State*

SPINAL ANÆSTHESIA is a great boon to the surgeon and anaesthetist.

There are many proprietary drugs for induction of spinal anaesthesia, but in my opinion the cheapest, best and least toxic is novocaine. In the beginning of its use the anaesthesia was induced with two per cent novocaine dissolved in

(Continued from previous page)

If the injured worm cannot be caught, a hypodermic syringe without the needle should be filled with corrosive sublimate solution and the solution forced in different directions into the wound; this is often very successful, especially when the wound afterwards is packed with cotton soaked in mercury lotion. The patients do not develop inflammation or abscess and the embryos of the worm which are discharged into the wound are destroyed.

(4) The worm may break while pulling, on the first or subsequent days. This may be due to excess of zeal on the part of the operator or to movements on the part of the patient at a critical moment, so that undue tension is applied to the worm. The treatment is the same as when the worm is cut.

When a worm cannot be extracted, injections of several c.cm. of mercuric chloride solution should be made into it. If a loop is pulled out injections should be made into each arm of the loop. If one end of the guinea-worm has come out naturally and it is so short that it cannot be caught, cotton-wool soaked in corrosive sublimate should be applied over it. If the end of the worm can be caught an attempt should be made gently to pull it, but it is better to inject corrosive sublimate solution (1 in 1,000) into it. This may be repeated daily for several days, and very considerably cuts short the suffering.

When extracting a guinea-worm, especially over the foot, care should be taken not to mistake a tendon, a nerve or a vein for the worm. Tendons and nerves are usually flat as compared with the worm. A vein over the hook becomes emptied of its blood, but on moving the hook and releasing pressure it becomes filled with blood and so can be distinguished from the worm. If a vein be cut bleeding occurs and gives trouble in extracting the worm.

I do not consider applications of cold water over a partly extruded worm, with the idea of encouraging the embryos and worm to emerge, are advisable, because such a procedure nearly always leads to ulceration.

[Note.—This article does not contain anything particularly original, but we print it because it gives a practical account of how guinea-worm may be dealt with in an ordinarily equipped hospital. 0.25 per cent novocaine seems very dilute.—EDITOR, I. M. G.]

distilled water but the complications attending on it were shock, backache, intense headache, and vomiting for three days or even more after the injection, owing to the large quantity of the solution that was being injected and sometimes it spread so widely over the spinal cord that the anaesthesia became generalized.

After a short trial of two per cent novocaine I started with five per cent dissolved in normal saline (9 grammes sodium chloride to a litre) and the doses injected depend upon the time needed for the operation.

1½ c.cm.	for operations under 40 minutes
2 "	" " " " 70 "
2½ "	" " " " 95 "

It is an ideal anaesthetic for all operations below the level of xiphoid sternum. The preparation of the patient for inducing spinal anaesthesia and the precautions to be observed are as follows:—

(1) The blood pressure of every patient must be recorded and pulse pressure below 25 is a contra-indication though I have tried it in some exceptional cases with a pulse pressure of 22. In stomach cases there is a generally low systolic and pulse pressure.

(2) A purgative is given one day before and an enema on the previous evening and not on the morning of the operation, as the irritation set up in the bowel causes defaecation on the operation table.

(3) Stomach lavage may be carried out as usual on the morning of the operation.

(4) A dose of 1/6 grain morphia and 1/300 grain hyoscine is essential at least three-quarters of an hour before the operation. The advantages derived from this preliminary injection are that it prevents shock and defaecation on the table, and the patient remains quiet, calm and drowsy.

(5) A few minutes before the spinal injection a hypodermic injection of 2 c.cm. of Labat's cardiac solution consisting of spartein 0.05 gm., caffeine 0.25 gm., sodium benzoate 0.30 gm. and strychnine sulphate 0.001 gm. in distilled water is given, and this keeps up the blood pressure. Fall in blood pressure is noted by rapidity of pulse, dilatation of pupils, dry tongue, hazy cornea, hoarse voice, and shallow respirations, when this injection may be repeated either hypodermically or intravenously.

(6) While separating adherent tumours from the abdomen, avoid rough handling near the splanchnic plexus.

(7) It is an ideal anaesthetic for all operations on the rectum and anus as it causes extensive relaxation of the sphincter.

(8) Glucose water, glucose and rum, plain iced water and coffee are permissible in all operations except those on the stomach.

(9) Patient to be placed in Trendelenburg's position immediately after the spinal injection to prevent anaemia of the vasomotor centre and

consequent fall of blood pressure and this position must be maintained for three hours after the operation.

(10) A sudden sense of oppression or burning in the pit of the stomach or in the cardiac area indicates the imminence of vomiting and the patient should be asked to open his mouth and take deep inspirations and the nose is held tightly closed by the anaesthetist.

(11) Spinal anaesthesia is contra-indicated in cases of adherent appendix, intestinal obstruction and strangulated hernia as the intestinal peristalsis set up causes rupture of the bowel. It is contra-indicated also in patients who have cough, as the contracted bowel passes easily through the relaxed abdominal rings and produces double hernia as a sequela. It is contra-indicated in children and in the very debilitated and the highly aged.

(12) All drugs that would cause peripheral dilatation of arterioles are contra-indicated as they are likely to produce anaemia of the vasomotor centre.

(13) Novocaine should always be freshly prepared and sterilized. A solution even two days old is less efficient.

(14) The operation is commenced immediately after the spinal injection.

(15) For gastro-jejunostomy the injection is made between the 12th dorsal and 1st lumbar vertebrae.

(16) Chloroform may safely be supplemented if the operation is prolonged for more than the time allowed for by the quantity injected. I have not tried more than  $2\frac{1}{2}$  c.cm. of 5 per cent solution and I think it is rather risky to try more than this quantity.

(17) No rectal medication or nutrition is to be administered for three hours after the spinal injection as the relaxed rectum and anus will not retain it.

(18) Spinal anaesthesia may be used in the reduction of strangulated hernia as it relaxes the abdominal muscles.

The following is a record of the operations performed under this kind of anaesthesia :—

Double inguinal hernia .. ..	2
Single .. ..	57
Hæmorrhoids .. ..	66
Hernia and orchidectomy .. ..	1
Chylocele .. ..	1
Hernia and hydrocele .. ..	4
Ovarian cyst .. ..	20
Appendicitis .. ..	21
Supra-pubic prostatectomy .. ..	18
Gastro-jejunostomy .. ..	25
Abdominal tumours .. ..	9
Supra-pubic cystotomy .. ..	25
Hydrocele .. ..	47
"    and hæmorrhoids .. ..	1
Abdominal cysts .. ..	2
Colporrhaphy .. ..	11
Cancer of the cervix uteri .. ..	2
Elephantiasis scrotum .. ..	7
Fibroid uterus .. ..	41
Laparotomy .. ..	24
Salpingectomy .. ..	4

(Continued at foot of next column)

## THE OCCURRENCE OF WEIL'S DISEASE IN INDIA

By B. M. DAS GUPTA

and

R. N. CHOPRA, C.I.E., K.H.P., M.R.C.P. (Lond.),  
M.D., Sc.D. (Cantab.)  
BREVET-COLONEL, I.M.S.

From the School of Tropical Medicine, Calcutta

FROM time to time epidemics of jaundice suggestive of Weil's disease have been described by workers in India, but in no case so far recorded could the causative organism be demonstrated with certainty.

Tucker (1907) reported a very severe epidemic of jaundice in the crowded quarters about the Byculla District of Bombay. These cases showed the usual signs of yellow atrophy of the liver and nine cases out of ten terminated fatally. No bacteriological examination was carried out. Franklin (1913) studied a mild outbreak of jaundice among the Kashmir Imperial Service Troops stationed at Gilgit, and a similar outbreak among the civil population of the locality. He suspected the leptospiral nature of the infection but did not come to any definite conclusion. Parmanand (1922) observed seven cases. The symptoms were typical of Weil's disease. In any case the causal organism was not isolated by culture and therefore the nature of the infection was not precisely ascertained. Liston (1922) examined the material sent to him from a fatal case at Santa Cruz. He found no spirochæte, but the histological appearance suggested acute yellow atrophy as the cause of death. Turkhud (1928) recorded two cases and believed

(Continued from previous column)

Ventral fixation .. ..	4
Vesico-vaginal fistula .. ..	1
Entero-anastomosis .. ..	2
Colostomy .. ..	1
Appendix and gastro-jejunostomy .. ..	1
Ovariectomy and appendix .. ..	2
Amputation of leg .. ..	12
Sinuses .. ..	12
Hæmatocele .. ..	5
Cancer of the penis .. ..	3
Orchidectomy .. ..	3
Tumour of the leg .. ..	1
Phimosis .. ..	4
Omentopexy .. ..	1
Cancer of the ileum .. ..	1
Plastic operation .. ..	1
Foreign bodies .. ..	3
Excision of inguinal glands .. ..	2
Dilatation of rectum .. ..	4
Wiring the patella .. ..	1
Osteomyelitis .. ..	1
Carbuncle .. ..	1
Abscess .. ..	8
Prolapse of rectum .. ..	2
Fistula-in-ano .. ..	34
Dilatation and catheterization .. ..	10
Urethrotomy .. ..	1
Internal and external podalic version .. ..	6
Forceps for obstructed labour .. ..	2
<b>TOTAL .. ..</b>	<b>517</b>

that they were cases of Weil's disease, on clinical grounds alone.

Pandit and Rao (1932) investigated an epidemic of jaundice in the Alipuram Jail. Clinical symptoms were of very mild character. Under the suspicion that the epidemic might have been one of leptospiral origin, they devoted all their energies to the isolation of the spirochete but with negative results. Failing to establish the leptospiral nature of the infection they were inclined to suppose that the disease was probably due to a filterable virus. From the foregoing account it would appear that laboratory confirmation is still lacking although cases suggestive of leptospiral origin are not uncommon in this country.

Knowles (1928) in discussing the position of Weil's disease in India remarked that it is almost certain that this disease exists in this country although it has not yet been possible to verify the infection by laboratory methods.

Taylor and Goyle (1931) in their celebrated work on leptospirosis confirmed this opinion and expressed their earnest desire that 'in future a complete investigation, particularly by blood culture and animal inoculation, should be carried out, in all suspicious cases of Weil's disease occurring in any part of India'.

It may be mentioned in this connection that Knowles and Das Gupta (1932) were the first to detect leptospiral infection in Indian rats.

On the 6th September this year a telephone message was received from Colonel Thakur, Superintendent, Sambhunath Pandit Hospital, stating that two cases of acute jaundice had been admitted to the hospital. One case, however, died on the following day. A report on this fatal case will be published later. The other case is the subject-matter of the present paper.

The patient was admitted to the hospital with fever, jaundice, conjunctival congestion and bleeding from the gums. The clinical picture presented was strongly suggestive of Weil's disease and so all our efforts were centred on isolating the causal organism.

**Blood culture.**—Although it was rather late (9th day of illness) blood culture was taken on Fletcher's medium, which is usually kept in the laboratory for the maintenance of stock cultures of rat leptospira. Six tubes were inoculated with varying amounts of blood (0.2 c.cm., 0.4 c.cm., 0.6 c.cm., 0.8 c.cm., 1 c.cm. and 1.5 c.cm.). Tubes I and II were incubated at 37°C., III and IV at room temperature (25.5°C. to 31°C.) and V and VI at 22°C.

**Blood inoculation into laboratory animals.**—Two young guinea-pigs weighing 192 and 202 grammes respectively were injected intraperitoneally with 2.5 c.cm. of blood.

**Examination of urine.**—The following procedure, as advocated by Knowles (1928), was followed. The meatus and the glans penis were cleaned with alcohol and then swabbed with cotton-wool soaked in sterile saline. A small

quantity of urine first passed by the patient was discarded, for obvious reasons, and then 20 c.cm. were centrifuged at high speed. The supernatant fluid was pipetted off and another 20 c.cm. were added to the same tube and centrifuged again. This process was repeated till the deposit from 100 c.cm. of urine was collected. This deposit was examined under the dark-ground illumination. The leptospira was first detected on the 19th day of illness. The spirochetes occurred in fair numbers. They possessed typical leptospiral characters but none were motile. Now a catheter specimen was obtained with rigid aseptic precautions and centrifuged. The deposit was then examined by the method mentioned above. A larger number of leptospiræ was found. In this case also they were immobile.

A quantity of centrifuge deposits plus 2 c.cm. of whole urine were injected into a young guinea-pig. Two tubes of Fletcher's medium were also inoculated with the catheter specimen.

### Results

**Blood culture.**—Out of six tubes one (inoculated with 0.6 c.cm. of blood and placed in a dark corner of the laboratory at room temperature) gave a very scanty growth of leptospiræ on the 13th day of inoculation. One of the two tubes incubated at 37°C. was found contaminated. The remaining tubes have remained sterile so far (till the 14th day after inoculation).

**Animal inoculation.**—The blood of the guinea-pigs was examined by dark-ground illumination from the third to the eighth day of inoculation. On no occasion could leptospiræ be detected. The concentration method advocated by Schüffner and Sieburgh (1926) was also tried with negative results.

**Urine.**—Direct examination of the centrifuged deposits (catheter specimens) showed the presence of leptospiræ from the 19th day of illness. They are still present (23rd day), although their number is decreasing.

The blood of the guinea-pig inoculated with the urinary deposits was examined 48 hours after inoculation, giving negative results.

The time for the examination of the culture has not yet matured.

**Comment.**—The workers who have successfully cultivated leptospira from the blood of human cases are inclined to the view that successful results are obtained only when the blood cultures are taken within the first seven days of illness. In a series of 64 cases studied by Taylor and Goyle (1931) in the Andamans the blood culture done later than the 7th day of the illness was invariably negative. It is significant that the present case gave a positive blood culture as late as the 9th day but the guinea-pigs inoculated at the same time proved refractory to infection. Although found in fairly large numbers in the urine the leptospiræ were always immobile and most of them showed varying degrees of degeneration. This is probably due

to the presence of plenty of bile (which has a lytic action on leptospira) still present in the urine.

### Conclusions

A case of Weil's disease with demonstration of the causal organism, *L. icterohæmorrhagiae*, in the blood (culture) and urine is recorded for the first time in India.

The writers' grateful thanks are due to Colonel K. S. Thakur, I.M.S., for so kindly drawing their attention to these cases.

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## A Mirror of Hospital Practice

### A CASE OF SPONTANEOUS HÆMORRHAGE FROM THE SKIN

By MIN SEIN, M.B. (Cal.), M.R.C.P. (Lond.)  
CAPTAIN, I.M.S.

Civil Surgeon, Toungoo, Burma

THE following case is described for its unique features:—

My own motor driver, a Mahommedan male, aged about 27, came running to me one day about March 1933 in great terror holding a handkerchief to his chin, which was soaking wet with blood. He said he had suddenly discovered blood oozing out of his chin and had tried to stop it but in vain. The handkerchief was soaked in about 15 minutes. On examination after cleaning the part I found a bead of blood oozing out slowly from what apparently appeared to be intact skin in the depression between the lower lip and the point of chin. After it was dabbed another bead appeared in its place within a few seconds. There was no mark of injury and the patient had not shaved himself prior to the bleeding, nor had he scratched the part with his nail or any sharp-pointed object. After watching the oozing for a few minutes I applied a small wad of cotton-wool soaked in adrenalin to the part and put on a chin bandage. The dressing was quite dry and I presumed that the bleeding had stopped, but on removal after a couple of hours the bleeding started again. This time the dressing was kept throughout the night and next morning, altogether for over 16 hours. There was no more bleeding after this period. I paid no further notice to it till about six or seven months later when he had another bout of bleeding. The same remedy was applied with equal effect. This time a complete physical examination was done but nothing abnormal was discovered. The man was a slim youth of 5 feet 4 inches. By temperament he was quick and intelligent.

Captain D. P. Mitra, I.M.S., who was then in charge of the Brigade Laboratory at the British Military Hospital, Mingaladon, also saw the case and kindly tested the coagulation and bleeding times which were reported to be quite normal.

The patient had an elder brother who had no similar trouble. There was nothing special in the family history. There was no history of excessive bleeding from injuries resulting in breach of skin. The chin appeared and felt normal. There was no tumour or

pulsation at the site of bleeding. There was no scab formation nor any sign of scar to indicate previous bleeding.

The man was lost sight of for the last three years or so but I am informed that he appears to be quite healthy and is still carrying on the same kind of duties.

It seems impossible to believe that spontaneous bleeding could occur from an intact skin until one encounters such a case as the above. If anæsthesia to deep pin-prick with the absence of bleeding can occur as a hysterical manifestation the reverse might be assumed, i.e., spontaneous bleeding from an intact skin. This is the only explanation I could offer to the phenomenon.

### Comment

A case of spontaneous bleeding from an intact skin is described. It is thought to be a hysterical manifestation.

### CARCINOMA OF THE PENIS IN A YOUNG MAN

By S. AHMAD, F.R.C.S. (Eng.)  
CAPTAIN, I.M.S.

Civil Surgeon, Sitapur, United Provinces

R. S., a Hindu male, aged 21 years, noticed a small indurated swelling on the penis near the frænum two and half years ago. This started increasing at a rapid rate and was excised by a doctor after three or four months. It, however, started growing again and eight or nine months later was operated on, the operation this time being a conservative amputation of the penis.

He was seen by me on the 23rd March, 1937, and admitted to the Sadr Hospital, Sitapur. There was a cauliflower mass with everted margins, sloughing surface and indurated base. The glands in the groin were not enlarged. There was hardly any penis left and the mass appeared to be springing from the perineum. Although the clinical diagnosis of carcinoma of the penis was obvious, a section was sent to the provincial pathologist, Lucknow, for confirmation in view of the age of

the patient. It was found to be squamous-celled carcinoma.

Radical amputation was performed on the 16th April and except for slight sepsis resulting in breaking down of the upper margins of the wound the patient made an uneventful recovery.

In writing this note, I am indebted to the provincial pathologist, Lucknow, for his report on the section and to Dr. K. M. Lal, medical officer in charge, Sadr Hospital, Sitapur, for keeping the notes of the case.

## A CASE OF ECTOPIC LEFT KIDNEY

By S. B. MEHTA, F.R.C.S.E.

MAJOR, I.M.S. (Retd.)

Parsee General Hospital, Bombay

D. I., aged 38 years, complained of pain in the navel and right lower quadrant of the abdomen for the last five years. She had frequent attacks of pain in front and behind lasting for ten minutes causing her to bend

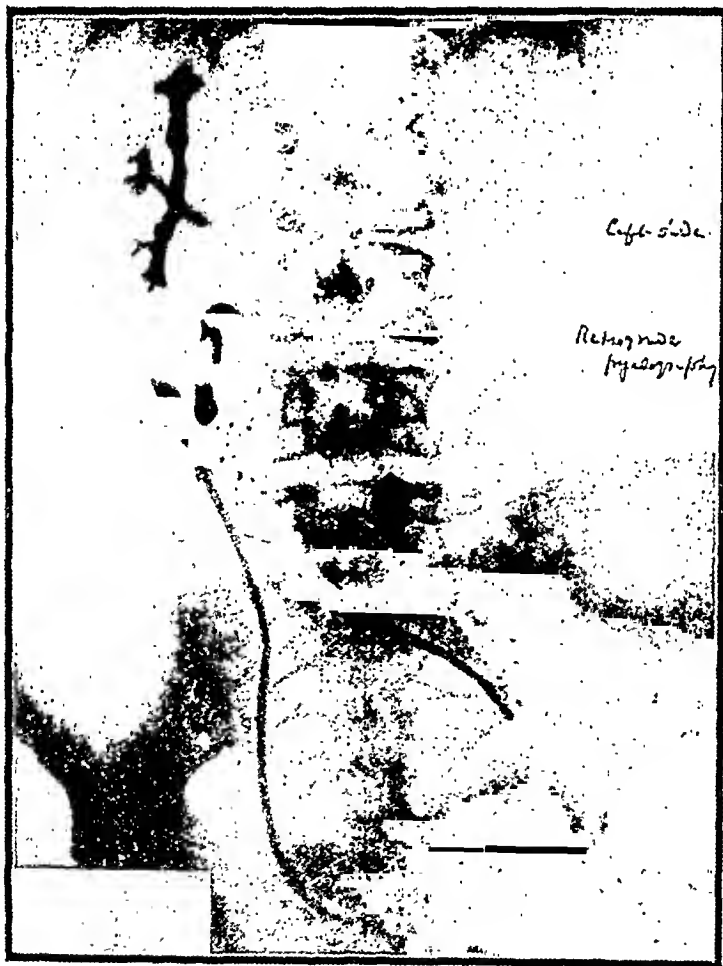
normal. An ordinary x-ray picture was taken showing both the kidneys on one side. Then cystoscopy was done and it was found that there were two urethral openings as usual without any abnormality in the bladder. Uroselectan B was given intravenously and the pyelogram showed as if the right ureter was running into the calyces of the left kidney. This impression is gained because of the right ureter crossing the plane of the left kidney. The next step was to do retrograde pyelography; this picture shows important details:—

(1) That both the kidneys are close together on the right side; the left lies lower and on a slightly forward plane.

(2) That the right kidney is apparently normal; the left in a condition of hydronephrosis and hydro-ureter. The hydro-ureter resembles the condition occurring during pregnancy in that the dilatation extends from the pelvic brim upwards.

(3) That the left ureter is crossing the middle line at the sacral promontory.

The left kidney has always been in this position and the question arises why is it giving rise to symptoms now when the patient



forward at times; she also complained of distention of the abdomen with gas on taking food. There is frequency of micturition with burning sensation. Periods 4/24. Married 21 years, four full-term children and one abortion of three months. Last child 5 years. Physical examination revealed a tender ball-like mass in the upper part of the right iliac fossa to right of the navel, which felt like a kidney and was very slightly movable. Uterus in good position, freely movable; no apparent congenital abnormality in the uterus. Adnexa seemed

is 38 years old. The late occurrence of symptoms is accounted for by the gradual development of hydronephrosis during the last five years. The low and forward position of the left kidney unprotected by the costal arch and the lumbar gutter, repeated pregnancies, the redundancy of the ureter passing over a bony point and consequent exposure have contributed

to the development of hydronephrosis and hydro-ureter. If the embryonic *anlage* of the kidneys be close together, fusion may result, often accompanied by displacement, or the left kidney may be pulled over to the right side and frequently there is a connecting isthmus of fibrous tissue or parenchyma giving the impression that the fused kidneys are only one.

I wish to express my thanks to my house surgeon, Dr. J. J. Masani, for helping me to take the photographs and Messrs. Schering-Kahlbaum Ltd. for reducing them.

### A CASE OF CATAPLEXY

By OWEN BERKELEY-HILL

LIEUTENANT-COLONEL, I.M.S. (Retd.)

Ranchi, Bihar

IN part 3, volume LV, of *Brain*, Dr. Max Levin of the Harrisburg State Hospital, Pennsylvania, contributes an article on this rare and obscure malady. He writes: "By cataplexy, a term first used by Henneberg, is meant the episodic occurrence of tonelessness, generalized or localized, as a reaction to an emotional stimulus (usually laughter). During the attack there is no impairment of consciousness, the cataplectic attack differing in this respect from the "Lachschlag" (laughing attack) of Oppenheim'. He further observes that the overwhelming majority of patients with cataplexy complain also of episodic morbid somnolence—a combination of symptoms to which the term narcolepsy, or Gelineau's syndrome, is applied.

In April this year Captain M. Kirk Bryce, I.M.S., sent me a European for my opinion as to the nature of periodic seizures from which he has suffered for the last 18 years and which show a tendency to increase in frequency. The history of the case is as follows:—

English male, aged 47, of healthy appearance, married 11 years and father of one child (daughter) aged 8, complained of uncontrollable attacks of collapsing to the ground whenever he was moved to anger or to mirth. He said: 'If I tell my wife a funny story while I am standing or walking and we laugh over it, my knees give way and I sink to the ground'. In addition to this, he stated that very frequently, when signing papers in his office, he would be unable to write more than half of his surname. His pen 'would not move'. This state of things lasted from quarter to half a minute and then he could finish his signature. He said that he never lost consciousness, and never had any twittings.

The patient is the fourth of eleven children. He has four brothers and five sisters alive. One sister died insane when middle-aged. His mother has an insane sister. There is no history of alcoholism or epilepsy in the family. His mother is alive but paralysed. His father died at the age of 60 of heart disease. He is happily married. His wife lives in England. He sees her every three years. While separated from his wife he masturbates once a week otherwise his 'semen dries up'. He is fond of sport. Takes very little alcohol. He never has had any form of venereal disease. As a child he had an ulcer of the intestines. When a small boy he was quiet and shy but successful as a scholar. He was not at all nervous and was fond of all the members of his family. With the exception of the

disability of which he complains, his physical health is very good. He eats well and sleeps well. He is occasionally constipated. Reflexes, deep and superficial normal. Cranial nerves unaffected. In short, there were no neurological symptoms of any sort.

The causation of cataplexy is extremely obscure. It is probably functional rather than anatomical. Consensus of opinion points to some dysfunction on the part of the corpus striatum but we know too little about the corpus striatum to be dogmatic. The relative frequency of narcolepsy in patients with the Parkinsonism of epidemic encephalitis lends probability to the assumption that the corpus striatum is in some way involved in the mechanism of cataplexy.

### A CASE OF CONVULSIONS

By KESHAV NATH KAUL, L.S.M.F. (Hons.)

Punjab Criminal Tribes Department, Lahore

SOMETIME back at Anantnag (Kashmir) a boy, A. K., aged about 10 years, was seen by me. His father stated that he was having epileptiform convulsions for the past 24 hours.

The history was that on the previous day the boy was punished by his father who had pulled his ears, as a result of which he opened his mouth, looked terrified and began to shiver. Since then he had three or four attacks of shivering with convulsions and transient loss of consciousness.

Previous history revealed that the boy was more mischievous and disobedient than others of his age. He is said to have been forecasting the weather correctly for the last few years. In fact the neighbours had come to regard him as a super man. His brothers and sisters were normal.

When the boy was first seen by me, he appeared dazed and frightened. On a cursory examination nothing abnormal was detected, so a purgative and a sedative mixture were prescribed and the boy sent away.

After four days the patient was brought again with a history of increase in the frequency of his fits. Details regarding the fits were enquired into and it was elicited that the patient used to yawn too often and sometimes while yawning his neck would turn to the right with conjugate deviation of the eyes to the same side. The whole body would get into a tonic spasm followed by clonic convulsions accompanied by momentary unconsciousness. His mouth would foam but the tongue was never bitten. Sometimes, urine was passed during the fits. During the intervals the patient remained generally drowsy and when this cleared he was as restless and mischievous as usual. There was no rise of temperature.

There was a definite history of voracious appetite for the last few months and to exclude worms as the cause for it, and the possible exciting factor of a 'reflex' type of epilepsy, two grains of santonin were prescribed at bedtime followed by a purgative next morning. A bromide mixture was prescribed to be taken three times a day. As a result of this treatment the patient passed nineteen round worms and the fits became milder.

Four days after, a second dose of santonin was prescribed but was refused by the patient. Appreciable improvement, though slow, began to set in but the parents being impatient turned to quacks.

After about a week the boy was brought back in a worse condition. The fits became more frequent, about 25 a day. At times five or six fits came on successively one after another resembling 'status epilepticus'. A mere sound was enough to excite a fit. In between the attacks he was rowdy and definitely maniacal. Erection of penis was a marked feature. As he had a long prepuce, circumcision was advised but was not performed.



The patient was immediately put on a mixture containing bromides and sodium bichlorate. A dose of santoin was also repeated, but at this time the patient passed only one small round worm. As he was very constipated and the motion very offensive, he was given grey powder on alternate nights followed by a saline purgative next morning. The convulsions gradually became less and stopped completely after a month. The mental outlook and general appearance also improved and the boy gradually returned to his preconvulsive 'normal' condition.

*Comment.*—It was a peculiar case with convulsions. There was definitely no hysterical element and moreover the fits were accompanied by definite loss of consciousness. Simple pulling by the ears as the exciting traumatic cause is too remote a possibility. It cannot be stated definitely that the fits were of reflex origin. Nor was the exciting cause only an emotional one—that of fright on pulling the ears—exaggerated in its effect due to the already unstable nature of the receiving nervous system?

## A CASE OF DATURA POISONING WITH HYPERPYREXIA

By N. R. KONAR, M.M.

Senior House Physician, Medical College Hospitals, Calcutta

An unknown, unconscious male, aged about 16 years, was picked up by an ambulance from a main thoroughfare of Calcutta at 2 p.m., on the 8th April, 1937. As the patient was not accompanied by any attendant, no history was available.

*Physical examination.*—The patient was moderately built and his nutrition was fair. He was unconscious and getting frequent attacks of generalized convulsions. Each attack lasted for nearly two minutes. There was nothing in the breath suggestive of poisoning. There was no discharge from the mouth, nostrils or aural passages. No signs of trauma were present in the head, neck or body. All the limbs were rigid but no paralysis was detected. Both the eyes were congested. The pupils were equal, widely dilated and reacted sluggishly to light. Corneal and conjunctival reflexes were absent. All the tendon reflexes were sluggish. There was no response in the abdominal and plantar reflexes. The neck was soft and Kernig's sign negative. The abdomen was distended and tympanitic. The liver was not palpable but the spleen was slightly enlarged. Heart sounds were feeble and the rate was 140 per minute. Breath sounds were feeble. Rectal temperature on admission was 107°F., pulse 140 and respiration 48 per minute.

*Blood examination report.*—White blood corpuscles—10,000 per c.mm., polymorphonuclears—75 per cent, lymphocytes—20 per cent, monocytes—3 per cent, eosinophils—2 per cent. No malarial parasites were found.

As the patient's condition was low, lumbar puncture could not be ventured upon.

Hyperpyrexia was controlled by hydro-therapeutic measures. An injection of quinine dihydrochloride gr. x was also given intramuscularly. The convulsions disappeared when the temperature came down to 101°F. But the patient gradually became comatose, his respiration was stertorous, pulse imperceptible at the wrist, and the heart sounds feeble and rapid. Cardiac stimulants and oxygen were administered. Ultimately the patient expired 15 hours after admission into the hospital. None of the atropine group of drugs nor stomach wash was given.

*Post-mortem report.*—Pharynx and œsophagus—healthy. Stomach—there were two small holes on the

posterior surface of the stomach towards the pyloric end with the surrounding portions of the wall thinned out for about three inches in circumference. It contained some brownish fluid. Intestines—healthy and contained semi-solid fæces. Liver—congested, weight—1,140 grammes. Spleen—enlarged, weight—345 grammes. Kidneys—congested, weight—210 grammes. Bladder—healthy and empty. Larynx and trachea—congested. Pleura—adherent on the right side. Lungs—congested. Heart—healthy and contained 5 ounces of clotted blood.

*Chemical examiner's report.*—Atropine in viscera.

### Discussion

The patient, found lying in the street in an unconscious state at midday during a hot summer month, with hyperpyrexia, congested eyes and widely-dilated pupils, was naturally suspected to be suffering from heat-hyperpyrexia.

The presence of an enlarged spleen with hyperpyrexia in a tropical country made the diagnosis of cerebral malaria probable, but malarial parasites could not be found in the peripheral blood.

Unconsciousness with hyperpyrexia is a feature of pontine hæmorrhage, but the age of the patient, his widely-dilated pupils, absence of paralysis and negative Babinski's sign were against such a diagnosis.

The clinical findings and presence of atropine in the viscera suggested that the patient died of atropine poisoning. Hyperpyrexia in cases of atropine poisoning has been recorded by Lyons and Witthaus.

As the patient appeared to be a beggar, he might have taken datura of which the active principle daturine produces the same type of symptoms as caused by atropine poisoning. There were two small holes in the stomach which were most probably due to post-mortem softening.

Poisoning due to the atropine group of alkaloids should be kept in mind as one of the causes of hyperpyrexia. Some of the cases which die or suffer from hyperpyrexia, and are diagnosed as heat stroke or cerebral malaria without confirmatory blood examination reports, might be cases of atropine poisoning.

I am indebted to Dr. M. N. De, in whose ward the case was admitted, for the permission to publish the case, to Rai Bahadur Dr. K. N. Bagchi for the report of the chemical examination of the viscera and to Major D. Ahmed for the post-mortem reports.

## A CASE OF VESICULAR MOLE

By D. R. LEWIS, M.B., F.R.C.S.E.

Civil Surgeon, Maubin, Burma

M. O. S., a Burmese female, aged 21 years, was brought to the hospital at 9-30 a.m. on the 2nd August, 1937, with the history that she had had a sanguineous vaginal discharge for the past month and that her uterus was

growing in size out of all proportion to her period of pregnancy, which was only three months. Careful inquiry elicited the fact that nodules like raisins were found in the sanguineous discharge. The patient had been married only three months. Her uterus on admission was at the level of the umbilicus. The disproportionate size of the uterus compared with the period of pregnancy and the history of sanguineous discharge together with the history of the presence of raisin-like nodules in the discharge led to a diagnosis of vesicular mole. As the patient was weak, due to continuous loss of blood, she was given rest for a day and a hypodermic injection of morphine with atropine was given, and calcium lactate administered by mouth with the hope that she would rally after resting for twenty-four hours. The rest however did not benefit her much. She had profuse loss of blood and her pulse became fast and feeble and her temperature rose to 101°F.; immediate evacuation of the uterus was therefore decided upon. The patient was put under chloroform and as her pulse rate was over 150 per minute she was given an intravenous injection of hypertonic saline, during the operation. Large masses were withdrawn from the uterus with ease and they presented the typical appearance of vesicular mole. The loss of blood at the time of evacuation of the uterus was not severe. The os was already slightly dilated. Further dilatation was effected by means of Hegar's dilators and the uterus cleaned out with a blunt flushing curette. After complete evacuation, gauze soaked in acriflavine lotion (1 in 1,000) was plugged into the uterus and the patient put to bed with the foot of the bed raised. As the uterine condition was septic she was given prontosil, three tablets a day, and on the fifth day after the operation the temperature came down to normal and on the seventh day the patient was up and about.

In view of the comparative rarity of vesicular moles in district hospitals I consider that the case is sufficiently interesting to warrant its publication.

### A MALIGNANT TUMOUR AFFECTING THE KNEE JOINT \*

By K. R. SITARAMA IYENGAR, B.A., L.M. & S.  
Assistant Surgeon, Government Hospital, Proddatur,  
Madras Presidency

A MALE, aged 30 years, of Golla caste, was admitted to the Government Hospital, Proddatur, on 19th June, 1937, with a huge tumour on his right knee joint.

*History of present illness.*—About three years back the patient remembers an injury to the inner side of his right knee which gave him pain for a few days but he was relieved of it in the course of a week. Two years after he says that he noticed a hard swelling at the site of the previous injury. This began to increase rapidly in size, the knee joint became fixed in a flexed attitude and the pain increased in severity. When he went to Cuddappah hospital last year, it appears, he was advised amputation which he refused, and he went back to his village where he tried the village *vaidyan* who applied some paste over the prominent part of the swelling with the result that excoriation of the skin occurred and his condition became worse.

*Condition on admission.*—(a) General:—A greatly emaciated and poorly nourished young man, lying on his left side, complaining of pain in the whole of his right thigh and leg, unable to lift himself up or turn from side to side. Tongue coated, rapid heart beats and slight hæmic murmur at the base. Lungs, liver and

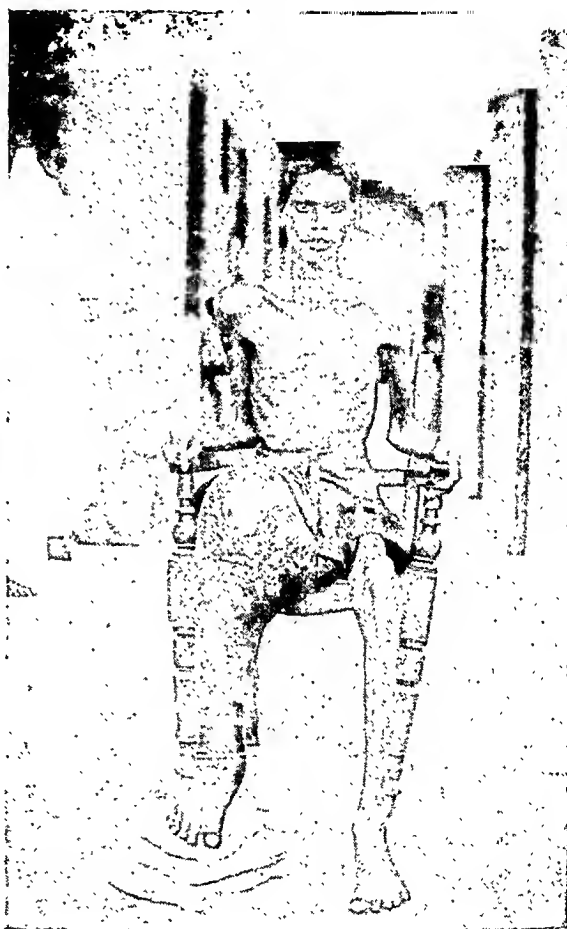
spleen appeared to be normal and abdomen was slightly retracted.

(b) Local:—A huge tumour involving the whole of the right knee, extending upwards to two-thirds of the thigh and downwards to one-half of the leg. The skin over it has become thickened and excoriation is present with blood oozing from that area. Large tortuous veins are visible all over the thigh and leg. The foot is swollen as a result of pressure over the vessels of the popliteal space.

Measurement around the prominent part of the tumour is 31 inches while the measurement around the left knee joint is 11 inches.

On palpating the tumour, it is found hard in some parts and doughy in consistency in other parts. It is in connection with the lower half of the femur and upper half of the tibia. The femoral glands are enlarged and feel soft to the touch.

Amputation of the limb was consented to by the patient and performed under spinal anaesthesia.



The leg was completely removed by disarticulation of the hip joint, and the enlarged femoral glands were removed as far as possible. Except for a little shock due to its severity, the man stood the operation well. The stitches were removed on the tenth day and the wound healed by first intention. At the time of sending the report, he is still in the hospital.

*Pathologist's report.*—Portions of the tumour were cut from the lower end of the affected femur and upper end of the tibia and sent to the Professor of Pathology, Medical College, Madras, and the report received was 'Small spindle cell sarcoma'.

# Indian Medical Gazette

OCTOBER

## FURTHER RESEARCH ON EPIDEMIC DROPSY

JUST over two years ago we devoted our editorial to the subject of epidemic dropsy, but as our readers are aware this was by no means an unusual departure because since its first recognition in Calcutta in 1877, and our first reference to it in 1880, it has frequently formed the subject of discussion in our editorial columns in the intervening thirty-five years.

Our excuse, if excuse be necessary, for so frequently returning to the same subject is that, in spite of the immense amount of work that has been done and the long list of names of distinguished physicians and research workers, principally in Calcutta, associated with these investigations the final proof of the ætiology of this serious disease is still unknown. In our last note on the subject we said 'Many theories regarding the disease have been formulated, have lived their day, and become history and have been revived again'. This sentence is more than ever justified by the events of the past two years.

As a result of the most recent work faulty or infected rice, which has been looked upon for a good many years, and has had proof after proof added from time to time to establish it, as the fundamental factor in the production of epidemic dropsy, is threatened in its pride of place and an attempt has been made to set up mustard oil in its stead. It appears that the rice supporters and the newer mustard oil advocates are in agreement in one respect and that is that a toxic body, whether pre-formed in the food or produced by bacterial or other action in the intestine, is most probably the cause of the disease. A toxin has been isolated from specimens of rice judged to be harmful, but up to now chemical analysis has failed to reveal in mustard oil any injurious substance, and samples of oil from stocks that have been connected with recent outbreaks have appeared to be fit for human consumption by all known methods of examination.

This is by no means the first occasion upon which mustard oil has been mentioned as the possible or probable cause of epidemic dropsy, because nearly thirty years ago it was first suggested as such and ever since then the idea has had its adherents. Most of these adherents have been among those of the lay public who were in intimate contact with or had suffered from the disease, but this cannot be said of the latest recruits to this theory for they are highly trained research workers who have carried out their investigations on the most approved modern lines of research.

They have considered the subject from several angles and have produced epidemiological evidence based on the careful analysis of numerous factors that there appears to be a correlation between the factors considered and the use of special stocks of mustard oil. These opinions have been strengthened by production of the symptoms of the disease in volunteers fed on the oil. There are some criticisms that may be levelled against the conclusions arrived at. For instance five of the six positive experimental cases had casts (some hyaline and some granular) in the urine. Nevertheless a fairly good case has been made by Dr. Lal and his associates for mustard oil, at least as the vehicle of the causative agent if not the actual cause itself. But an equally good and in some respects a better case was formerly made in favour of rice being the root of the trouble, so mustard oil cannot yet be looked upon as the proven cause of epidemic dropsy although this research indicates it should perhaps have further attention paid to it from this point of view. In our opinion one of the most valuable products of this investigation is that it has supplied fresh evidence that epidemic dropsy can occur in persons who have not used rice at all, so it should stimulate further search for the causative factor on wider lines than have hitherto been employed. It is possible that the substance causing the disease is carried by but is not an intrinsic constituent of any one food.

Another small but important paper has been published recently by Bt.-Colonel Chopra and other workers in which evidence of a toxic body in the blood plasma of epidemic dropsy cases has been demonstrated by the effect of such plasma on cell growth in tissue cultures, especially on those of the embryo heart. During this part of the investigation it was noticed that some of the degenerate cells showed cytoplasmic granules and attempts were made to propagate a possible virus on the chorio-allantoic membrane of the egg. A few suspicious lesions were produced and it is claimed that the same type of lesions were caused in five successive generations of eggs by passage, but the infecting agent was lost after that. This work is suggestive but cannot be considered definite enough to establish the presence of a filterable virus in epidemic dropsy. The conclusion of these workers, that the presence of a 'toxic agent' has been demonstrated in the plasma of epidemic dropsy patients, must be accepted, but whether this unknown body is a primary toxic agent or a secondary one arising from cell damage by the real causative factor or yet may be of the nature of a virus must be left for further research to determine.

The baffling nature of the ætiology of this disease naturally leads to speculation, and we crave the permission of our readers to embark upon a small speculation of our own and to suggest the revival of still another theory that may be worth while inquiring into more fully.

than has been done hitherto. It is the theory that the fundamental cause of epidemic dropsy is a dietary deficiency, which permits of the establishment of an otherwise innocuous infection and the production of toxins with all the attendant signs, symptoms and pathological changes. When one reads the histories of beriberi and pellagra one cannot help comparing them with the investigations into epidemic dropsy, and when this has been done one must be impressed by the fact that these diseases, whose ætiology is now firmly established, went through practically all the stages of theorizing through which epidemic dropsy is now passing, and they were successively ascribed to similar

causes before they were removed from that once large but ever diminishing group of diseases of unknown ætiology.

This editorial should serve to show that the difficulties in finding the cause of epidemic dropsy are not disheartening to the workers engaged upon it, but rather do they seem to be stimulating them to greater efforts, and at the same time attracting new recruits to this intriguing field of research. To the worker or group of workers who finally discovers the cause of this serious and important disease the honour will be great in proportion to the difficulties that have to be surmounted, a fact which should add still further impetus to the work.

## Special Article

### DEVELOPMENT OF HEALTH EDUCATION WORK IN UNITED PROVINCES

By KHAN BAHADUR DR. ABDUL HAMID, B.Sc.,  
M.B., B.S., D.P.H., R.C.P.S. (Eng.)

*Assistant Director of Public Health, Hygiene Publicity  
Bureau, United Provinces*

SOME of the activities of the Hygiene Publicity Bureau, United Provinces, were described in a special article which was published under the above title in the *Indian Medical Gazette* of December 1934. This article deals with the subject of medical inspection of scholars.

*General remarks.*—A scheme with part-time medical officers under the education department had been at first tried in the ten biggest towns for five years but it was discontinued as control was difficult, and it was replaced by the present scheme under the Public Health Department from July 1931. In this account of the work of the medical inspection of boys in schools, since it has come under the public health department, is included a review of the last six years' work.

The problem of preventive medicine demands a wide outlook and prevention of disease is possible if efforts are made from the very beginning of life. The care of the mother, the infant and the child is the real basis for the improvement of national health. Small defects, minor maladies and infectious diseases, if left unattended to at the young age, gradually lead to damage of a permanent nature. School hygiene, home hygiene and community hygiene are thus intimately connected with, and complementary to, each other.

The health of the school child being the basis of the health of the nation the school medical inspection has been rightly placed under the state health service. The hygiene publicity bureau is the section of the public health department for doing health education work and the medical inspection of the school child has been

placed under this section. The continuity of the system and its coordination has been maintained under the supervision of the Assistant Director of Public Health of the bureau.

The health education of the school child is an important activity of the Red Cross as well, which is also placed under the hygiene publicity bureau. The Director of Public Health and the Director of Public Instruction, besides the Inspector-General of Civil Hospitals, are among the vice-chairmen of the executive committee of the provincial Red Cross. The Director of Public Instruction is the chairman of the junior Red Cross section which deals with the work in schools, and the junior assistant in the hygiene publicity bureau is the deputy director and honorary secretary of the section.

The provincial centre of the St. John Ambulance Association, of which the training for the Mackenzie School certificate course is an important activity, was moved to Lucknow in 1936 and placed under the hygiene publicity bureau, and the personnel of the executive committees of the two organizations was made almost identical. The assistant director of public health hygiene publicity bureau, as the honorary secretary of the provincial branch of the Indian Red Cross Society, became the honorary general secretary of the St. John Ambulance Association, with his senior assistant as joint honorary secretary of the association, and an officer of the education department in Lucknow as honorary secretary for the school work of the association.

It will be seen that thus the liaison of the public health department with the education department for health education work has been perfected.

(a) *Staff and duties.*—In the thirteen biggest towns whole-time school health officers have been employed in inspecting scholars in all government and aided English, middle and high schools, intermediate colleges, normal schools

and training colleges. Unaided recognized institutions of the same denomination are also included in the scheme. The school health officers in Agra, Allahabad, Benares, Cawnpore and Lucknow belong to the provincial public health service, possessing a diploma in public health, and those in Meerut, Saharanpur, Jhansi, Gorakhpur, Fyzabad, Bareilly, Moradabad and Shahjahanpur belong to the subordinate provincial public health service, possessing a licence in public health. They are also school medical officers for doing treatment work in the hostels of government institutions. During the summer vacation and on the outbreak of epidemics and sometimes on other occasions, such as for anti-rabic work, the whole-time school health officers assist their municipal medical officers of health under whose administrative control they have been placed locally, and for whom they have also occasionally officiated in short-period leave arrangements.

(b) In the remaining towns the municipal medical officers of health are the *ex-officio* school health officers and they carry on the school work in their respective areas. They are also the school medical officers for the treatment of scholars in the hostels of government institutions.

(c) In the smaller municipalities where there are no municipal medical officers of health and in 34 districts of the district health scheme the district medical officers of health are *ex-officio* school health officers for doing the school medical inspections.

(d) Officers of the provincial medical service, the subordinate provincial medical service and private practitioners are employed by the education department for the treatment of inmates of hostels in aided schools and also in government schools where the public health staff is not available.

(e) The school health officers of all classes are required to do a detailed medical inspection of scholars in the institutions mentioned in paragraph (a) above. The routine medical inspections are conducted at three stages during the child's school life, *viz*, at entrance, in the middle of the school career and at the end, and a medical history, on the approved form, is filled up. All the scholars are also seen on parade from time to time and those who are apparently defective are made to fall out and undergo an examination in detail. Also the children, who are referred by teachers or guardians for any particular ailment, are examined as special cases and re-inspections are made of those requiring special attention. In vernacular schools the children are examined at ordinary inspections, as far as possible, once in the lower primary stage, next in the upper primary stage and lastly in the middle school stage; the history sheet for these children is of a simpler form.

(f) Vouchers drawing special attention of the guardians to the presence of various defects

which need attention are issued to the sickly children for those who are examined in detail.

(g) The whole-time school health officers have, in addition to their duties of inspection, been holding clinics at the central school dispensaries established since July 1934 at Agra, Allahabad, Cawnpore, Benares and Lucknow for the maintenance of which a fee of As. 1 per boy is charged monthly. The system of treatment and the work at the clinics will be referred to later.

(h) The school health officers are also required to give lectures on hygiene at the government training colleges and normal schools and to hold magic lantern lectures. The school health officer, Agra, is the *ex-officio* lecturer in hygiene in the medical school.

(i) The school health officers are also required to examine candidates for the certificate of the Mackenzie school course in hygiene, sanitation and first aid.

*Some achievements.*—It is the whole-time school health officers who are in a position to devote their full attention to their work. But the *ex-officio* school health officers, who have many other duties, have also made valuable contributions.

*Conference of school health officers.*—The keenness of the whole-time school health officers impressed the director of public instruction so much that the need of holding a conference of the officers was felt by him, at an early stage of the work, to provide an opportunity for the exchange of ideas. This conference was held in 1932. A discussion of the difficulties experienced in carrying out the work in a satisfactory manner, the recommendations for overcoming them, the constructive suggestions for improving the scheme and the proposals for adopting preventive and curative measures led to the early establishment of the work with remarkable uniformity and popularity, and also modifications and additions in the education code and establishment of clinics in five towns.

With a view to improving the efficiency of the work the whole-time school health officers were supplied with a set of diagnostic instruments for medical inspections and several of them were deputed for training in the eye, ear, nose and throat departments of the medical college, Lucknow, and the medical school, Agra.

The heads of the institutions were advised through the circle inspectors to hold a conference of teachers and guardians at the beginning of the school year in order to explain the aim of the school health work and ensure their co-operation in addition to their annual conferences which are held at the end of the year and at which the school health work is also discussed. As a result of these conferences the school authorities have on the whole co-operated satisfactorily, and the parents have also taken an interest to some extent. The co-operation of the school teachers has resulted in the provision of weighing machines and the recording of the weights-and-



heights to the satisfaction of most of the school health officers, and the schools have almost invariably endeavoured to meet the requirements unless they have been handicapped by financial difficulties.

*Provisions in the education code.*—A new paragraph was added to the education code enjoining upon the English institutions co-operation with the school health officers in maintaining the health of scholars. The medical history sheet is to be filled up for each scholar, which is to be transferred with the certificate of transfer.

In another paragraph of the education code it was provided that an unvaccinated boy was not to be admitted into a recognized English institution except on the clear understanding that he shall get vaccinated in the next vaccination season.

Under another paragraph the head of a recognized institution suspecting a scholar to be suffering from a communicable disease was authorized to exclude him till a medical examination had been made, and in the event of the suspicion being confirmed by such examination the scholar was to be debarred from attending the institution until certified free from the disease by a competent authority who was the school health officer.

The school health officers were required to grant certificates of physical fitness to the selected candidates for normal and training schools, free of charge.

*Weight standard.*—From the statistics collected by the school health officers the following table of average weights and heights for various ages has been prepared. The statement is of great value in judging the proper development of the scholars of different ages. In the table the existing English standard has also been given side by side for comparison.

*Table of average weight and height for various ages*

Age in years	FROM THE REPORT OF THE ANTHROPOMETRIC COMMITTEE OF THE BRITISH ASSOCIATION FOR THE ADVANCE- MENT OF SCIENCE		FROM THE DATA COLLECTED BY THE HYGIENE PUBLI- CITY BUREAU IN UNITED PROVINCES	
	Weight in lb.	Height in inches	Weight in lb.	Height in inches
6	44.5	44	37	43
7	50	46	45	46
8	55	47	49.5	48.5
9	60.5	49.5	59.5	53
10	67.5	52	60	54
11	70	53.5	63.5	55
12	75.5	55.5	68.5	57
13	82.5	58	74.5	57
14	92	59.5	84.5	59
15	102.5	62	89	60
16	119.5	64.5	98.5	62
17	..	..	100.5	64
18	..	..	104	64.5

*Health intelligence quotient.*—It is an axiom that better health is the result of the practice of health habits and the transgression of the laws of health ends in diseased conditions.

In order to ascertain the frequency of those unhealthy habits which invariably result in ill health the school health officer in Cawnpore worked out figures for what he called the health intelligence quotient, attributing ill health to one or more of the following five causes:—

- (i) physical defects,
- (ii) lack of control over habits,
- (iii) fatigue,
- (iv) faulty food and faulty habits of eating,
- (v) faulty general habits.

Twenty questions were issued to 893 scholars of various classes and taking 100 as the health intelligent quotient of an ideal scholar it was found that the quotient among the various groups examined ranged between 60 and 70 and the analysis of the results showed that:—

- (1) 42 per cent go to bed at irregular hours.
- (2) 41.6 per cent have worries or are fretful.
- (3) 38.5 per cent are fussy about food.
- (4) 33.5 per cent take insufficient exercise.
- (5) 35.1 per cent bolt their food.
- (6) 17.5 per cent are in the habit of taking stimulants.
- (7) 31.9 per cent have a knowledge of defects in themselves but do not attempt to correct them.

The inference is that there is a great need for the correction of habits and raising the health intelligence quotient, which can be done by the proper practice of health rules.

*Diet problems.*—The above-mentioned enquiry also emphasizes the necessity of paying greater attention to the conditions of nutrition. Faulty nutrition is not only a problem of food supply but also of environment, habits and other factors. It was found in Cawnpore city that 7.3 per cent of boys were too ill-nourished to be considered fit to receive the benefits of education, and they did not necessarily belong to the poor classes.

Investigations into the problem of the school-boy's diet was made in an intermediate college at Lucknow and it was found that 52 per cent of boys took decidedly less protein than they ought to do and the protein in most cases was of poor biological value. It was found that 65 per cent took less carbohydrate than was required under a desirable standard. It was also discovered that 70 per cent took excess of fat, only 5 per cent being below the standard so far as this food factor was concerned. This excess of unassimilated fat in the diet of the growing child is therefore a strong indication for a more active life. The investigating officer did not consider the deficiency in protein and carbohydrate to be due to poverty, as most of the boys in the investigation belonged to the middle classes and their food was not particularly deficient in vitamin content as only 13 per cent



did not take fruits and 21 per cent did not take milk.

It was observed in Agra that the inmates of hostels who remained in the hostels during short vacations exhibited a greater improvement in weight than those who went home frequently, as the former were constantly on a prescribed diet and they had to lead a regulated life. The conclusion that can be drawn from these observations is that the correction of injudicious dietary depends largely upon the regime of life that a schoolboy follows—and that is an educational problem.

*Sprouted gram.*—The scheme of supplying sprouted gram to the schoolboy during the day, at a monthly cost of a few annas, has been spread all over the province. The school health officers have formed the opinion that the supply of gram is useful and at Shahjahanpur it was calculated, with a control test, that in the case of gram eaters the average increase in weight in six months' time was 0.8 pound per head over those who did not eat the gram. From a few of the larger towns, however, it is reported that the gram, although occasionally interspersed with fruits, is not attractive enough to the taste of the scholars of English schools.

*Milk.*—Under the scheme of the free supply of milk to the ill-nourished and poorer boys, which has been in force in the towns where the central school dispensaries are situated, the school health officer in Cawnpore reported that in one year 150 boys were given milk in 10 schools. Each boy was given a quarter seer of dairy milk in the middle of each working day and monthly records of weight were kept. Although the data are meagre, it is noteworthy that there was on an average an increase of 2.7 pounds in weight per head in three months' time over the average of 1.0 pound of the controls, that is, a nett gain of 1.7 pounds per head. In one school the milk was discontinued after three months and a fall in the average gain was markedly noticeable, the gain being only 0.2 pound above the average of 1.0 pound of the controls. This observation shows that three months' feeding on milk left its mark for some time, even after its discontinuation.

The results of feeding on pasteurized milk in 14 schools in Lucknow, on the same principle as in Cawnpore, were worked out and it was found that the gain per 100 pounds of body-weight was remarkably rapid as shown in the graph.

Encouraged by these results eight milk clubs were started in schools in Lucknow where the boys got milk from the government military dairy farm on payment.

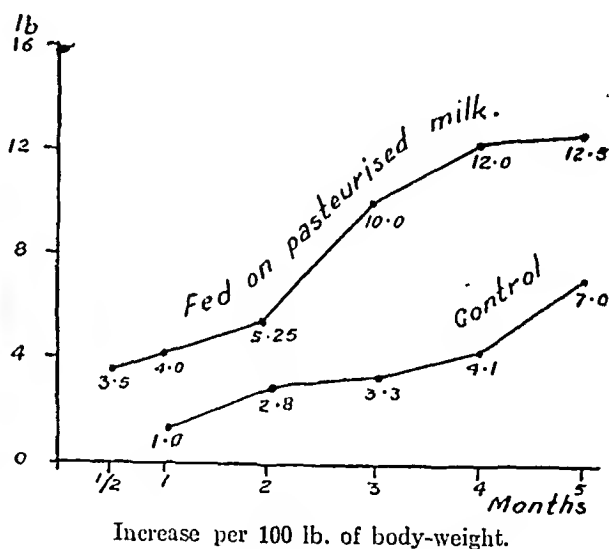
In Lucknow a free meal scheme was carried out in one of the primary municipal schools and the same set of boys was fed by turns on whole milk, separated milk, gram, 'moong', soya bean and parched wheat and it was noted that the gain in weight was most marked when the boys were fed on milk and separated milk.

In Benares pasteurized milk was supplied free to 290 boys with a total of about 21,000 meals of a quarter of a seer of milk; over 90 per cent showed a marked increase in weight, the gain being greater among those who were more undernourished to begin with and proportionately less as the original weights approached the average. The graph for Lucknow also indicates that undernourished boys gained in weight appreciably and rapidly in three months' time when they were fed on milk.

Pasteurized milk in the same quantity as elsewhere was supplied to 252 boys in Allahabad in 1936-37 and milk was also given in Agra but further details were not worked out.

*Gradation of physical exercise.*—Good use of the records of heights and weights was made in the municipal high school, Benares. On account of the keen interest taken by the headmaster it was possible to classify scholars into age groups on the basis of their physical development.

GRAPH



Graduated exercises were prescribed for the various physical ages. The exercises were :—

- (i) Scout drill.
- (ii) Group games, viz, kabaddi, hockey, football, volleyball.
- (iii) Sports, viz, jumps, climbs, *gatka pheri*.
- (iv) Marching—formation of ranks, still walking.
- (v) Breathing exercises.

Exercises involving the movement of larger muscles were given to scholars of tender age and weak constitution, strenuous exercises were reserved for the stronger groups and care was taken not to overexercise them. The result of the system was that in one year 20 per cent of boys advanced in their physical age.

*Mental subnormality.*—For educational purposes the mentally retarded boys are on a different level from those who are mentally defectives. Mental retardation may be congenital, known as dullness, or acquired, known

as backwardness. The mentally defective can be classed under feeble-minded, imbecile or idiot. It is only the border-line cases which can be expected to profit by education in separate schools. In 1934-35 eight children from the compulsory education area in Lucknow were referred to the school health officer, and five of them were found feeble-minded. In the same year six children were referred to the school health officer, Allahabad, and he found that two of them were idiots. In 1935-36 the school health officer in Agra carried out an investigation of border-line mental cases in 19 municipal vernacular schools and found 3 per cent were feeble-minded and 1.6 per cent were backward. He found one case of 'feeble-mindedness' during his routine medical inspection of the anglo-vernacular schools in 1936-37 and 66 of backwardness out of a total of 4,180 boys, giving a percentage of 1.6 of backwards for these schools as well. These results show that the conditions responsible for backwardness are working universally. In 1936-37 in Cawnpore about a dozen cases were referred to the school health officer and one was found to be mentally defective. Mental defects of whatever category, like physical defects, reflect on the domestic environment, and their presence should make the guardians feel at one with the school health service which serves to detect conditions that affect the scholarship of their wards adversely.

*Statistics of medical examinations in 1936-37.*—The detailed examination of boys was conducted in 151 out of 161 anglo-vernacular schools within the larger municipalities where the whole-time school health officers are employed. The number of boys whose history sheets were filled was about 20,500 out of 54,000 on the rolls, the enrolment having increased by about 7,000 since 1932. Out of 508 primary and vernacular schools 175 were visited for ordinary examinations, consisting of the noting of the main defects, and out of 69,000 boys in them 15,000 were examined. About 3,000 were examined as special cases and 7,000 were re-examined. These examinations were additional to a large number of parade inspections.

The reports submitted by the 19 medical officers of health, who are *ex-officio* school health officers for the schools in their municipalities, show that out of a total number of 58 schools for detailed examination 51 were visited and out of about 18,000 boys on the rolls 8,000 were examined. These officers also inspected 113 schools out of 218 for ordinary examination and examined 10,000 out of about 24,000 on the rolls.

Similarly, the 29 district medical officers of health who submitted their reports made detailed inspections in 77 out of 83 schools and examined over 6,000 boys out of 20,000 on the rolls. The number of schools for the ordinary examination in their areas was 10,500, of these 2,000 were

visited and over 12,000 boys were examined out of about 80,000 on the rolls.

*Medical examination in girls' schools.*—In the year 1932-33, in concurrence with the inspectress of schools, the school health officer in Allahabad conducted the medical examination in some girls' schools and reported that the main defects in the girls were the same as in the boys but 'dirt diseases' were 35 to 50 per cent less common. The percentage of anæmia, however, was twice as great and was attributable to social restrictions which prevented the girls from making a fuller use of open air life.

#### *Statistics of main defects*

*Poor nutrition.*—In the larger urban areas this defect was 12 per cent in 1935-36 against 13.9 per cent in 1931-32. It went up to 17.6 per cent in 1936-37. In rural areas the percentage of this defect was 19.2 per cent in 1931-32, 19.8 in 1935-36 and 17.5 in 1936-37. The variability of this defect in the urban areas and its high percentages in both urban and rural areas should be regarded seriously by the guardians as an indication for improving the faulty diet. The incidence of the largest proportion of all the ill-nourished children has been in the age group of 7 to 10 years. The improvement of nutrition is primarily the guardian's affair. Faulty food spells faulty nutrition and food is the greatest of all factors on which the efficiency of nutrition depends. The investigations of the school health officers on some aspects of the diet problem have been reported in earlier paragraphs, and it is high time for all concerned to realize the sequence of faulty food, faulty nutrition, faulty function, faulty structure, faulty health and disease. It is not necessary for them to dabble in the caloric, bio-chemical and vitamin values of food but they should realize the simple fact that all the body needs for perfect nutrition is provided in the relatively few foodstuffs, *viz*, wholemeal bread, milk and its products, eggs, green leafy vegetables, root vegetables, legumes, fruit, meat and water, which are within the means of most of those guardians who can really afford to send their boys to the anglo-vernacular schools or for higher education.

*Defective teeth and gums.*—In 1936-37 there were 10.4 per cent of scholars with defects in teeth (caries). The percentage in 1931-32 was 12. The percentage for this defect in rural areas was 10.7. Pyorrhœa has been found in 6.8 per cent in urban areas, specially in the higher age groups, while it was 1.7 in rural areas. On the whole, better care of teeth and gums is taken in rural areas.

*Enlarged tonsils and adenoids.*—The enlargement of tonsils and adenoids, which is an indication of the access of undesirable matter to the gateway of the organs of digestion and respiration, is another common defect. Dirt and dust nuisance, overcrowding, lack of fresh air, ill-ventilated rooms, unhygienic and damp

localities, septic teeth, improper feeding and sleeping with the face covered, all tend to produce this defect. In 1936-37 it was found in 12 per cent of boys in urban areas and in only 2 per cent in rural areas, where it was twice as high in 1931-32. The open atmosphere in rural areas no doubt accounts for the marked difference, although the faulty habit of mouth breathing in rural areas is three times as high as in urban areas. The enlargement of other glands, specially neck glands, which indicates chronicity of tonsillar enlargement was 3.7 per cent in urban areas against 1.8 per cent in rural areas.

The conclusion is that, to counteract the harmful effects of overcrowding in cities, greater attention should be paid to open air exercises inasmuch as air is the food for lungs, which purifies the blood and is of great nutritional value. Incipient cases of tuberculosis of the lungs and of the other organs have been from time to time detected here and there both in urban and rural areas.

*Anæmias.*—Anæmia associated with enlargement of the spleen is due to malaria and in five years' time it has shown a marked fall from 3.5 per cent to 0.7 per cent in urban areas and from 7.2 per cent to 3.8 per cent in rural areas. The higher figures for rural areas are due to the malarial fever being more widely spread in those areas where its control is a big problem. The figures for anæmia due to other causes are comparatively small, although in 1932-33 the school health officer, Agra, reported that every seventh case of anæmia was due to intestinal parasites affecting nutrition.

*Skin disease.*—The 'dirt diseases' of the skin in urban areas have been in the neighbourhood of 3 per cent but in rural areas they have fallen from 9 per cent to 3.4 per cent. This is in a great measure due to the junior Red Cross movement in the districts.

*Diseases of eyelids (conjunctivitis and granulation).*—In urban areas the 14 per cent of 1931-32 gradually came down to 5 per cent in 1936-37 and in rural areas it has kept in the neighbourhood of 6.5 per cent, although it was recorded in one year as low as 5 per cent.

*Defective vision.*—In 1932-33 the figure for defective vision in urban areas was 13.3 per cent and in 1936-37 14 per cent. The facilities for testing and treatment of vision cases have increased, specially on account of the school clinics since the work was started, and the figure for 1936-37 is decidedly less than the maximum of 17 per cent recorded in 1934-35. In rural areas in one year the maximum was 1.9 per cent but it was 1.3 per cent in 1936-37. These figures are not the records of actual incidence as the facilities for its detection in rural areas are few.

*Unvaccinated.*—The maximum of 14 per cent unvaccinated was reduced to 4 per cent in urban areas in 1936-37 and from 24 per cent to 7 per cent in rural areas. These are remarkable

reductions which speak well for the school health service.

*Some other defects and diseases.*—The routine examination has from time to time revealed cases of leprosy, goitre (in Pilibhit, Bahraich, Ballia, Garhwal, Naini Tal and as high as 10 per cent in Gorakhpur district), hydrocele, hernia, elephantiasis, cataract, stone in bladder, palsies, facial paralysis, venereal disease, epilepsy and microfilaria in the blood. In 1934-35 in Benares 13 per cent out of a total of 185 boys in a hostel were detected to be harbouring microfilaria, while in another, three miles away, all were free. Cases of flat-foot have been recorded in Gorakhpur, Fyzabad and Jhansi. Abnormalities, viz, dextrocardia, congenital heart and transposition of liver have also been found. Suppurative middle ear disease has been reported to have followed infectious fever.

Cases of mumps, malaria, measles, chicken-pox, diphtheria, cerebro-spinal fever, infective conditions of the skin and trachoma have been detected from time to time. In December 1935 the spleen index in the Brindaban municipality was found to be 19.3 per cent and in April 1936 it was 16 per cent. The index in the Muzaffarnagar district which has a canal system was 15.6 per cent.

In 1933-34 there was an outbreak of influenza in a hostel in Allahabad and cases of cerebro-spinal fever occurred in Allahabad, Bareilly and Meerut. In Agra 21 boys suffered from cerebro-spinal fever in 1934-35 and one case which occurred in the government training college died of the disease. The same year in Benares 421 scholars suffered from epidemic dropsy. In 1935-36 there were again cases of epidemic dropsy in Benares and also in Fyzabad. In Benares 6 per cent were found with defects in the heart on account of having suffered from the epidemic dropsy and 5 per cent with nervous conditions, on account of the same disease, and in 1936-37 defective vision was found among 14.4 per cent against 9.4 per cent and 3.2 per cent of the same boys in the previous two years, the increases being due to the after-effects of epidemic dropsy. The unmistakable inference is that, although the glaucomatous condition cleared up with the other signs of the disease, the disease had left a lasting effect on the vision of its victims.

*Significance of statistics.*—The basis of school hygiene is the systematic inspection of scholars by making a physical survey of the individual child, whether sick or healthy; detection of defects, incipient maladies and infectious diseases in the school-going population, and keeping a constant watch on the weakly type which stands in the greatest need of medical supervision, so that he is made fit to receive the education imparted to him in the school. In this way the mental, physical and moral development of the growing child is kept in harmony and an atmosphere of healthfulness is created. The statistics of defects give an

indication of their prevalence which, within certain limits, will show variations as they are not separate entities. It is noteworthy that the percentage for all the main defects comes to over 71 in urban areas if it is assumed that the defects were uniformly spread over all the boys and no boy had more than one defect. This figure for rural areas is over 38. It has also been calculated that, roughly, 28 per cent of boys have one defect, 11 per cent two defects and another 4 per cent more than two defects in urban areas, so that there are not less than 43 per cent defectives to share all the defects. These figures for rural areas are 18 per cent, 5.7 per cent and 2.8 per cent, respectively, giving a figure of 25.5 per cent defectives to share the defects. These figures are for the year 1936-37. Just as failures at examinations are not eliminated by raising the standard of teaching and yet the improvement in scholarship is the constant aim of all educational institutions, so the defect complex more or less persists and the improvement in the health conditions found in schools is to be determined by such all-pervading influences as health education and home environment.

*Sanitation in schools.*—The school health officers inspected the sanitation of the hostels and school premises, water supply, adequacy of ventilation in class rooms and the suitability of the furniture, and they gave the necessary advice to the local authorities concerned. The condition of the sanitation of the premises is summarized under the remarks that the general cleanliness in the high schools is more and in the middle schools less satisfactory, while in the municipal primary schools it is most unsatisfactory owing to the fact that the schools are located in hired buildings which were never meant to be schools. The sanitation of the primary schools in the rural areas is comparatively better. The school health officers made a sad commentary on the sanitary conditions of the municipal primary schools and on the facilities in them for physical exercise, which were few and far between. Nor did they consider that the accommodation and seating arrangements were satisfactory. The health of the school child depends greatly on the provision of ample playgrounds and the school health officer, Saharanpur, has rightly remarked that, as a result of the inattention to physical exercises, defects tend to persist. The officers who inspected some of the municipal girls' primary schools found them also well below the mark.

*Remedial measures.*—While dealing with nutrition, stress was laid on the necessity of direct action on the part of guardians and too much importance cannot be given to the necessity of their active co-operation for the improvement of the other conditions detected by the state health service. It is not possible to review the history of the school health officers' efforts and struggles to establish treatment centres without making this article unduly lengthy.

Although the five school health officers in the biggest towns have had the largest number of schools to inspect they have since July 1934 taken upon themselves the additional work of running the central school dispensaries, otherwise known as clinics, as they are not only places for dispensing drugs but also are centres of educational treatment for follow-up work, where the guardian comes in contact with the school health officer. In 1933-34, 200 guardians attended the central school dispensary with their wards in Lucknow. The public dispensaries are too crowded during the short hours of the morning, when scholars cannot attend without detriment to their studies. The clinics are held in the afternoon and scholars have attended them regularly for ailments which need a prolonged and regular treatment. The clinics have also served as a sorting station for cases which require hospital treatment and operations. For example; in one year the total number of operation cases in Agra was 82, of these eleven underwent operations for enlarged tonsils. In another year 31 cases of advanced tonsillar enlargement were operated upon in Agra and 22 in Lucknow, on the advice of the school health officers.

Boys with defective vision received particular attention, and in addition indigent boys had the benefit of the free supply of glasses. In one year the number of defective vision cases at the clinics was 1,700 and 472 pairs of glasses were supplied free. In another year (1936-37) 455 pairs of glasses were supplied free and 219 pairs of glasses were purchased by the boys. At the Lucknow clinic 31 minor surgical operations were performed in 1936-37. At the clinics, cases of defective teeth and gums were suitably advised and attended to wherever honorary dentists have attended them. In this respect the services of the honorary dentist of the Balrampur hospital, Lucknow, are deserving of special mention as he has from the beginning attended the clinic regularly. Honorary dentists in Cawnpore and Agra have also very kindly rendered assistance. Dentists, ophthalmologists, and in one place a specialist in ear, nose and throat diseases, have, without the prospect of any remuneration, worked at the clinics at a sacrifice which is commendable. In one year 550 boys were given dental treatment at the clinics.

The total attendance at the clinics was 25,000 in the first year, 37,000 in the next and over 43,000 in 1936-37, the maximum daily average attendance at a clinic was 40 in 1935-36 and 57 in 1936-37. The average number of visits per scholar was about 4. It is obvious that the school clinics can touch only a small fringe of the work. The aim of the clinics has been to centralize treatment and they are attended by inmates of hostels as well, with the result that the stock of medicines kept in the hostels has been reduced to a minimum for emergency use only. The free supply of milk to about 1,500

boys annually has been made from the funds of the school dispensaries. The annual maintenance expenses of each school dispensary is Rs. 3,000.

Various other measures of treatment were adopted in the other places where the whole-time school health officers are working. For example, in Bareilly, Jhansi, Meerut and Gorakhpur, they have by arrangement from time to time attended the Sadar hospitals at fixed hours when defective boys were called and their prescriptions have been honoured. In 1936-37 the officers issued over 350 emergency prescriptions. In Gorakhpur the schools have formed a schoolboys' medical service association for the treatment of scholars, levying a fee of 6 pies per boy per month to meet the expenses of the treatment of vision and dental cases by local practitioners. Under this arrangement 31 surgical operations were performed in one year. An anti-goitre campaign by iodination was undertaken in the Pilibhit town and in 17 schools in the Gorakhpur district where a few cases were practically cured and an average reduction of three-quarters of an inch was produced in the neck measurement.

Some of the school health officers have persuaded the municipal boards to take definite steps to improve the health conditions in their vernacular schools, specially in Cawnpore, Shahjahanpur, Fyzabad and Jhansi. In Cawnpore a dispensary for municipal schools forms a section of the school clinic and is run by the school health officer. About 23 per cent of the total cases in the clinic were from the municipal schools in 1936-37. In Jhansi washing and bathing arrangements were made in schools of the compulsory area and a sum of Rs. 100 was sanctioned in 1934-35 for the supply of free glasses. In the same year the Agra municipality sanctioned Rs. 300 for the supply of drugs and for washing and bathing arrangements, which was repeated in 1935-36, and 22 boys were also supplied with glasses free. A supply of marmite sandwiches and milk was made to the sufferers of epidemic dropsy in Benares and a cure rate of 20 per cent and improvement in 63 per cent were reported. In the hostel in Benares, where microfilaria infection was detected, the use of mosquito-nets was made compulsory.

Some laboratory work has also been done in the central school dispensaries and the aid in diagnosis by the free examination of laboratory specimens at the provincial hygiene institute has occasionally been given.

The village-aid medicine chests provided the best means of giving medical relief of first-aid nature in rural areas. They are almost invariably in charge of teachers and are equipped with simple remedies.

On the educational side the junior Red Cross movement has created much interest in health work, specially in the shape of the practice of

health habits competitions and cleaning campaigns. The reports of the school health officers in these areas form interesting reading and the activities have been described at length in the various reports of the Red Cross. The number of groups in the calendar year 1932 was 1,049 with a membership of 29,000 including 33 girls, and in the calendar year 1936 it was 4,576 with a membership of 100,810 including 6,521 girls, over 90 per cent of the groups being in rural areas.

The attendance of cases in other dispensaries as recorded by 31 civil surgeons in 1936-37 shows that out of about 50,000 schoolboys 2,700 were voucher cases in urban areas and out of 70,000 the number of voucher cases was about 2,000. As expected the percentage for municipal areas has gradually decreased mainly on account of the central school dispensaries and has doubled in rural areas, which is evidence of greater interest taken by guardians.

*Anti-epidemic work.*—The school health officers have done a considerable amount of work in the control of epidemics. In 1932-33 it was noticed in Agra that out of 10,000 re-vaccinations not less than 6,000 were given to the schoolboys; this was due to the confidence reposed in the school health officer. In that year 23,000 boys and some girls were also vaccinated by these officers or under their supervision, in the thirteen bigger towns.

In 1933-34, in Agra during the malaria season, arrangements were made for the free supply of quinine; 964 inoculations were done during the plague season, 4,500 were re-vaccinated, and a campaign of throat gargles and nasal douche with potassium permanganate lotion was organized on the outbreak of cerebro-spinal fever, as a prophylactic measure, and contacts were excluded from the schools. There was an outbreak of influenza in one of the hostels in Allahabad that year and cases of cerebro-spinal fever occurred in Allahabad and Bareilly. In Bareilly 1,305 vaccinations and 623 anti-plague inoculations were performed; anti-cholera inoculations were also given to the pilgrims (not schoolboys) proceeding to the Hedjaz by the school health officer, Bareilly. In Benares 1,664 vaccinations and re-vaccinations were performed. In Gorakhpur 461 vaccinations were performed and quinine was extensively supplied. A cook in a hostel in Gorakhpur suffered from plague and 927 boys were inoculated. In Meerut 358 anti-plague inoculations were given in anglo-vernacular boys' schools, in girls' schools and in European schools. In Lucknow, the school health officer attended the infectious diseases hospital for 21 days during the cholera epidemic in addition to his usual work. Vaccinations and re-vaccinations were performed in the schools, in Agra the number of vaccinations was 4,357 and a few anti-typhoid inoculations were also given. Schoolboys and teachers took anti-cholera and



anti-malarial measures in the Shahjahanpur and the Saharanpur municipalities.

Similar anti-epidemic measures were taken in 1935-36 and 1936-37. In the latter year about 9,000 vaccinations and re-vaccinations were performed in Agra, Allahabad, Cawnpore, Benares and Lucknow and 3,207 anti-plague inoculations in Benares.

Thus the school dispensaries have, since their establishment, served as centres for anti-epidemic work and on account of these dispensaries the school health officers had better opportunities and greater facilities for taking these measures.

Besides the whole-time school health officers the *ex-officio* school health officers took anti-epidemic measures in their areas, as part of their general duty.

*Health education.*—It will be seen that the important objects of the health work in schools for the study of the prevalence of diseases and defects in the school-going population, and for the adoption of the measures for their prevention and removal have been kept well in view. The establishment of the work in a period of six years has justified the extension of the work in several directions. The establishment of treatment clinics in the other places, further concentration in the existing areas and the introduction of the work in full measure in other places and for girls' schools as well are the needs, the fulfilment of which is a question of finance. Last but not least the success of the scheme depends greatly upon the health education of the schoolboy and also his guardian, who should come in closer contact with the work.

For the improvement of the conditions in schools, health education ranks high in importance and all the school health officers paid considerable attention to this aspect of their duty as well. They took part in the conferences of headmasters and guardians. A large number of lectures on hygiene and first aid, according to the programme of the St. John Ambulance Association, was given by them in the training colleges and in normal schools, also in the

Patwari schools and to the physical training classes of the education department. A number of lectures on these subjects was illustrated with magic lantern slides and cinema films of the hygiene publicity bureau. The school health officers took an active part in collaboration with the officers of the education department in organizing divisional and provincial ambulance competitions. In 1933-34, an officer of the hygiene publicity bureau gave training in first aid to a class of girl guides of various girls' schools in Lucknow. At Bareilly and Jhansi the training in first aid was given to girls also. A large number of examinations of candidates of first aid and home nursing classes was held and the number of candidates examined for the Mackenzie school course certificate has ranged between 5,500 and 6,900 annually. Mention of the junior Red Cross work has already been made.

### Conclusions

The scheme of the medical inspection of schools under the thirteen whole-time school health officers has been well established and useful data have been collected and investigations made. The establishment of the central school dispensaries in five places has added to the usefulness of the scheme in these places and has by contrast brought to the forefront the void that exists in other places where there are no clinics. The Education Re-organization Committee, U. P., have, therefore, felt that the scheme should be given wider scope by an increase in the personnel of those entrusted with the work, more arrangements for treatment by specialists, arrangements for the examination of girl pupils, an improvement in the sanitation of schools, and greater stress laid on health education and training, and they have issued a questionnaire to decide upon the line of action to be taken. Funds permitting, such recommendations, when given effect to, will afford an opportunity for expanding, in several directions, the good work which is being done in this province.

## Medical News

### THE LEAGUE'S WORK ON HOUSING

#### *Nature and objects of the league's work*

THE Housing Commission of the League of Nations Health Organization and its Sub-Committees on Noise and the Hygiene of Environmental Conditions met at Geneva from 23rd to 29th June.

The league's work in this field arose out of the studies of housing made by the health organization in 1931 in connection with a European conference on rural hygiene, and also out of its investigation in 1932 into the effects of the economic depression on public health.

At the 1934 assembly a number of delegations urged the importance of the problem of housing. The assembly adopted a resolution asking the council to

bring the matter to the notice of the health committee. The bureau of the latter in November 1934 adopted a number of resolutions which formed the starting point for the work of the health organization on housing that has since made rapid strides.

According to the usual procedure of the health organization, a special housing commission was formed with the object, first, of collecting all the available documentary material with a view of defining the problem and indicating the solutions arrived at, and, secondly, to prepare a plan of studies coming strictly within the province of the health organization.

The programme of studies was approved in January 1936 by the health committee and the council of the league. It has a definitely scientific and technical



character, but essentially practical aims—definition of the principles of modern hygiene as regards urban and rural housing, national urban and rural planning, and placing of all the experience resulting from these studies at the disposal of administrations and legislative bodies.

The ultimate object of the housing commission is to 'arrive at a definition for various climates, customs and regions of standards of what might be called healthy urban and rural housing and healthy town and country areas'.

The housing commission's programme covers a wide field and includes the following items:

- (a) Hygiene of the environmental conditions in dwellings (temperature, freshness, humidity, movement of the air and temperature of the enclosure).
- (b) Noise and housing.
- (c) Sun-exposure.
- (d) Natural and artificial lighting.
- (e) Density of the population, 'zoning' and open spaces (gardens, parks, playgrounds, etc.).
- (f) Campaign against smoke and air pollution.
- (g) Methods of water supply, sewage, waste and garbage disposal.
- (h) Administrative and legislative aspects of housing hygiene.
- (i) Definition of healthy urban and rural dwellings, as well as healthy cities and rural areas (regional types of urban and rural dwellings and of urban and rural planning).

#### *Coordinating and stimulating national initiative*

With a view to coordinating the carrying out of this programme and again in accordance with what has become the general practice of the various commissions of the health organization, national committees have been formed in a number of countries (United States of America, France, United Kingdom, Netherlands, Poland, Sweden, Czechoslovakia). The members of the housing commission represent the national committees in that commission.

The purpose of forming these national committees is twofold. On the one hand, the use and means of providing for hygienic housing have, for the most part, been studied, perfected and applied by engineers in various special branches, *i.e.*, heating, ventilation, lighting, sanitary engineering, etc., by architects and by town planners much more than by health experts; and as a rule no regular co-operation has been established between medical men and these various technical experts. More and more numerous methods of building and arranging dwellings have been used; but while they may be considered as a step forward from the technical point of view, it does not necessarily follow that they offer advantages from the health point of view. Sufficient account has not always been taken of the fact that all the research work and all the technical efforts must aim at the improvement of the living conditions of the occupants. Yet the purpose of housing which must never be lost sight of is to ensure the comfort, the preservation and increase of physical and mental fitness, and therefore also the health of the occupants.

From this point of view the advantage of establishing national committees is that for the first time bodies have been constituted providing for coordination between the various technical and health activities and facilitating the discovery and comparison of new methods and solutions and the determination of their advantages; *i.e.*, bodies which can lay down common principles and secure their practical application.

The second purpose served by the national committees lies in the fact that they offer the best possibilities of establishing the most extensive and rational co-operation in the international sphere. Their liaison is provided for in the best manner by the

housing commission of the League's Health Organization, of which their representatives are members. Their documentary material and the results of their studies, which are regularly transmitted to the health section, permit of the establishment of a centre combining all information on the entire housing problem with regard to situation, achievements and regional experience. These national committees are thus in an excellent position for utilizing and disseminating the results of this joint international work by adapting them logically to regional characteristics and necessities.

Consequently, the housing commission considers it important that (a) National Committees should be set up in all countries; (b) all National Committees should be represented on the general Housing Committee of the League's Health Organization.

#### *Co-operation with the international labour organization*

The investigation of the problem of housing is part of the three-year plan of the health committee. This plan contemplates co-operation with the international labour office. Representatives of the international labour office accordingly took part in the work of the housing commission and its two committees.

The two sub-committees are concerned with the first two items of the programme of studies, *i.e.*, the hygiene of the environmental conditions and noise and housing. The two committees have been set up because corresponding items of the programme of study had reached a sufficiently advanced stage. It is expected that further committees will be formed as and when the work on the rest of the programme necessitates this measure.

#### *Noise and public health*

The housing commission's committee on noise and housing submitted its report and its plan for further investigation. It pointed out that the problems of hygiene, comfort and fitness and health which arise in dwellings vary in degree rather than in kind from country to country. In noise, we are faced with an environmental problem which has markedly increased in significance in recent years with the development of a mechanized civilization.

It must be recognized that individuals vary very much in their sensitiveness to noise, but there is a general consensus of opinion that the widespread use of recent inventions, particularly radio sets, by the public, the increase in motor traffic and modern methods of building and road construction have led to an increase in noise which is intolerable to many. Such noise is calculated not only to handicap the performance of work but to destroy the amenities of home life, and by disturbing rest and sleep contribute to ill health in the community. It has further to be realized that present-day buildings are for the most part deficient in adequate sound-insulating properties owing to the methods of construction and the lightness and high conductivity of many of the materials.

'The nature of sound and noise is usually extremely complex, and their effects on the human organism depend on numerous physiological and psychological factors. As regards the campaign against noise in dwellings, with which we are chiefly concerned, the loudness and the power of the noise appear to be the most important criteria. While the two are connected, the relationship is not always simple. The power or energy of noise is usually measured by microphone-amplifier instruments—while the loudness may be measured by either subjective or objective meters, the latter being essentially microphone-amplifier instruments specially modified to simulate the acoustic characteristics of the ear for different types of noise. The unit of measurement of noise is the *decibel* in some countries and the *phon* in others'.

The committee submitted the following table illustrating approximately the loudness of some everyday noises:—

0 decibels or phons	..	limit of audibility.
10 do.	..	slight rustling of leaves.
20 do.	..	whispering.
30 do.	..	very quiet street.
40 do.	..	average noise in dwellings.
50 do.	..	noise in commercial premises.
60 do.	..	ordinary conversation.
70 do.	..	loud conversation.
80 do.	..	heavy urban traffic, loud radio.
90 do.	..	proximity of motor-cycle with silencer.
100 do.	..	very loud motor horn at about 7 metres.
110 do.	..	metal worker's shop, proximity of pneumatic road drill.
120 do.	..	aeroplane propeller at 5 metres.
130 do.	..	limit of pain.

It points out that American, English, German and Swedish literature contains information on the standards of noise which are considered desirable and practicable in flats and other residences; the figures recommended, which tally with one another to a large extent, range between 20 and 40 phons depending on the circumstances and the character of the noise.

Various measures may be taken to ensure that such standards of noise are not exceeded in flats or other premises. They require to take account of the noise made by traffic and industrial noises, and that made in the building itself by neighbours. They comprise questions of technique, building and internal planning, town planning, legislation and education.

From the point of view of town planning it is desirable (a) to insulate residential quarters from the noise of road traffic and other industrial noises by 'zoning'; and (b) to direct road traffic into certain main arteries. The methods of construction of roads and streets are also of considerable importance in this connection.

Many technical measures have been advanced for diminishing noise in the streets caused by motor cars, motor cycles, trams and other vehicles. The legislation of certain countries tends to make the application of such measures compulsory. For example, German legislation prescribes that the noise produced by a motor vehicle at a speed of 40 kilometres must not exceed 85 phons and that produced by horns, 100 phons at 7 metres distances. Similar recommendations have been made in Great Britain and Holland. Many countries restrict both night and day hooting of horns.

As regards building methods designed to provide insulation from noise coming from outside or from neighbouring dwellings, a distinction should be drawn between

(a) Methods providing insulation for the building as a whole from its surroundings.

(b) Methods insulating the individual dwelling (1) from noises from outside (insulation of outer walls and windows); (2) from noises in neighbouring rooms (insulation of doors, partition walls, floors and ceilings, insulation of pipes, etc.).

The purely scientific study of the phenomena underlying the origin and propagation of noise in dwellings has made considerable progress. Although the problem cannot be regarded as completely solved from the scientific point of view, the practical results already achieved suggest certain principles which can be recommended for general application.

Certain differences of great practical significance exist between 'air-borne' and 'structure-borne' or 'impact' noises. The two call for very different methods of treatment.

The committee gives a number of details as to the different types of measures that may be recommended for dealing with these different aspects of the noise problem in its relation to housing and public health. They indicate their plan of future studies. Their object, they say, is to define if possible the practical measures that may be taken to safeguard the individual, the family and the community against nuisance and harmful effects of noise. Although science has yet to solve many of the problems of noise, it is definitely worth while to indicate the palliative and preventive measures which may be taken in view of the present state of knowledge and experience in various countries.

The most important of these measures is briefly indicated by the committee as follows:—

#### I. Measures involving minor expenditure

(a) The use of the quietest rooms in the house as bedrooms—particularly for young children.

(b) The cultivation of public opinion that in the use of powerful wireless sets and other sources of sound the feelings of neighbours are worthy of consideration.

(c) The use of suitable ear stops by individuals whose rest and sleep is disturbed by noises outside their control—particularly by night workers who have to sleep during the day.

(d) Reduction of internal noise in a dwelling:

(i) Good internal planning of the dwelling before construction.

(ii) The use of sound-absorbing wall and ceiling finishes to an extent depending on the conditions. It must not be forgotten that agreeable acoustic conditions inside a room are likely to result from the use of thick carpets, heavy curtains and furnishing.

(iii) The insertion of canvas hose or the like in ventilating ducts between the fan and rooms concerned.

(iv) The use of resilient supports for machinery such as water pumps, compressors, refrigerators or air conditioners.

(v) The insertion of a length of rubber hose in the water piping system to prevent the conduction of sound from taps or circulating pumps.

The measures listed in this group are capable of immediate application and are calculated to lessen the harmful effects of noise and by so doing improve the living conditions of families and individuals whose dwellings are of necessity in noisy areas.

#### II. Measures involving expenditure by individuals or public authorities

(a) Town planning with a view to locating dwellings in quiet areas, and as far as possible away from roads subjected to heavy traffic.

(b) Co-operation between the local authorities and industrialists in planning the layout of noisy plant, e.g., transformer stations may be screened by existing buildings.

(c) Allowance of more time by local authorities for the execution of road breaking contracts.

(d) Reduction of noise at its source, e.g.:

(i) Use of silencers on motor vehicles and road breaking pneumatic hammers.

(ii) Increasing restriction of the use of motor horns by day or night.

(iii) Restriction of speed of traffic in residential areas.

(iv) Installation of quiet sanitary appliances.

(v) Wearing of shoes with rubber heels.

(vi) Use of resilient floor coverings or thick carpets.

(e) Insulation of dwellings against external noise.

The adoption in building practice of the use of materials and methods of construction calculated to reduce the loudness level of noise penetrating a dwelling, e.g.:

(i) Double windows.

(ii) External and partition walls providing agreed standards of insulation.

(iii) Use of resilient floor coverings (floating floors) and suspended ceilings.

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(iv) Use of noise filtering ventilators, and ventilating ducts lined with sound absorbent materials.

The committee concludes by observing that 'experience in many countries has already shown that the measures indicated above may be successfully employed to lessen the nuisance of noise in many situations. It is true that in special cases scientific methods of assessment of noise are necessary before the appropriate remedial measures can be specified, and that in certain cases the remedy prescribed may be costly. In the public interest it is highly desirable that information as to the present state of knowledge and proved experience in these matters should be widely distributed. Health authorities, scientists, architects and engineers should be encouraged to face problems of noise without delay and, side by side with the promotion of further research, technical instruction should be provided for those who are and who will be responsible for safeguarding the amenities of home life and of residential areas. While the problem of noise has become acute owing to scientific progress and invention, and while we can, with confidence, look to physical science to provide the solution of new problems as they arise, it rests with all concerned to ensure the speedy application of existing knowledge to present-day conditions'.

#### *The committee on hygiene and environmental conditions in the dwelling*

The committee on hygiene and environmental conditions in the dwelling (temperature, humidity and movement of the air, and temperature of the surroundings) also presented its report to the housing commission. It pointed out that one of the primary objects of housing, in its most primitive as in its most up-to-date forms, is to protect the individual from climatic discomforts, especially heat and cold. The environmental conditions of the dwelling which provides this protection must accordingly be such as to permit the maintenance of equilibrium between the production and the loss of heat from the human body. In addition to the maintenance of thermal equilibrium, environmental conditions should be such as to promote physical and mental fitness and the feeling of well-being.

The principal environmental factors influencing the maintenance of thermal equilibrium, and consequently physical and mental fitness and the feeling of well-being are:

- (a) The dry-bulb temperature of the air.
- (b) The humidity of the air.
- (c) The movement of the air.
- (d) The mean radiant temperature of the surroundings, including walls, flooring, ceiling or roof, windows, heating appliances, human bodies.

Although it does not directly affect the thermal equilibrium of the human body, a fifth factor, the quality of the air—and more especially its purity—must also be taken into consideration, because it may have a fundamental influence on the sense of well-being and physical and mental fitness.

Various methods have been suggested for combining in a single index the effects of the factors regulating the heat loss of the human body. The committee enumerates the several methods proposed. It adds that it is impossible to establish a uniform standard applicable in every country for the optimum environmental conditions governing bodily heat exchanges. Standards or zones of comfort have been indicated by the hygienists of various countries on the basis of the various indices that have been suggested. These standards are valid only for the region, type of occupation, indoor conditions (residence, office, workshop, theatre, cinema, restaurant, train, etc.), national or local heating methods, type of clothing, age, race, season and climate for which they were established.

What is more, other things being equal, the sensation of comfort varies in different individuals. For this reason, the zones of comfort indicated by the various methods represent a sort of 'mean' comfort, i.e., the

sensation of comfort as felt by the majority of persons examined.

Owing to differences of climate and national custom, hygienists hold different views as to the best standards for temperature movement and moisture of the air. Thus, British authorities are in favour of a lower range of temperature for home or similar conditions than their American colleagues, although their views on minimum air movement are the same. Whereas Anglo-American hygienists prefer very slight air movement, in France, perhaps due to long-standing customs, the aim is to prevent any air movement at all, however slow, in the immediate vicinity of the individual.

The committee discussed methods of measuring environmental conditions; the transmission and accumulation of heat by building materials; the different heating, cooling and ventilation systems (or space and air change) in their relation to various types of housing, that is both to homes and to public buildings of different kinds. The standards applied in different countries for the floor space or cubic content of family dwellings vary to some extent on account of the differences of national customs and standards of living. On the whole the committee assumes, however, that on hygienic grounds a living room used in the daytime or a sleeping room at night should each provide at least 15 cubic metres per person; and if sleeping and living rooms are separate, a total of at least 25 cubic metres per person for a total dwelling is essential.

The importance of air conditioning is emphasized together with the dangers of exaggeration and standardization in this field. The need for air conditioning, it is suggested, applies particularly to sub-tropical and tropical climates and the related problems are worthy of further study.

The committee concludes its review of the different aspects of its subject with the remark that 'the engineer has at his disposal a wide choice of systems of heating, cooling, ventilation and air conditioning. He must make a judicious selection, and adapt the operation of the systems in every case to actual economic and physiological needs; for it must always be borne in mind that the subject of all these measures is man, and their purpose to ensure his comfort, physical and mental fitness and health'.

A programme of further studies is outlined by the committee which ends its remarks by emphasizing the necessity for studying 'the application of hygienic principles to the various methods of building construction, heating or ventilation favoured in various countries. Co-operation between economists, hygienists, engineers, physicists and architects is essential for a speedy and rational solution of these problems. Such co-operation can only be expected if there is mutual understanding of these human problems and therefore the incorporation of appropriate teaching in the curricula followed by students training for the professions concerned is a matter of the first importance.

'In promoting, correlating or conducting such studies and in encouraging education as indicated, we feel that the Housing Commission and its National Committees can materially help to improve the conditions of life'.

#### WILLIAM GIBSON RESEARCH SCHOLARSHIP FOR MEDICAL WOMEN

We learn that the Council of the Royal Society of Medicine has awarded the William Gibson Research Scholarship for women to Dr. Nancy E. G. Richardson of London, and that she proposes to carry on research on 'Carbohydrate metabolism in pregnant and lactating women in relation to the principles secreted by the anterior lobe of the pituitary'.

#### INDIAN MEDICAL COUNCIL

LIEUTENANT-COLONEL R. S. TOWNSEND is nominated as a member of the Medical Council of India, *vice* Lieutenant-Colonel W. E. R. Diamand resigned.

## Current Topics

### Constipation and its Treatment

By A. F. HURST, M.A., D.M., F.R.C.P.

(From the *Practitioner*, Vol. CXXXVIII, February 1937, p. 121)

CONSTIPATION is generally regarded as the most common of all maladies and the cause of innumerable ills. I believe on the contrary that it is an uncommon and unimportant disorder, which rarely gives rise to symptoms. It is unusual to be consulted for constipation by a patient who is not already treating himself. The aperient habit generally begins for one of two reasons. The normal rhythm of the bowels may have been upset by an illness or accident confining the patient to bed, or by a period of stress in which he had no time to give to the calls of nature; medicine given for a temporary condition continued to be used when it was no longer required. Alternatively, the aperient was first taken by the patient for symptoms which he had been led to believe were caused by auto-intoxication resulting from constipation. But whatever the origin of the habit the patient regards himself as constipated because he takes aperients, which is a different thing from needing them. When eventually he seeks medical advice for his 'constipation', he generally does so because he believes that any symptoms from which he may be suffering are a result of constipation. On inquiring about the state of his bowels, however, one learns that he is passing two, three or more large unformed motions a day—that he is, in fact, suffering from self-induced diarrhoea, and not from constipation at all. One is often told that he has not passed a solid stool for months or years and yet he ascribes his symptoms to constipation, although constipation means the passage of hard, dry, and infrequent stools.

#### PHYSIOLOGY OF THE COLON AND DEFÆCATION

When the colon is watched with the x-rays no movements can be recognized under ordinary conditions, as the propulsive movements produced by the muscular coat occur only three or four times a day, and the churning movements produced by the muscularis mucosæ are so slow that they can be recognized only by comparing plates taken at intervals of a minute or more. The contents of the ascending colon are propelled to the pelvic colon by 'mass peristalsis' in response to the gastro-colic reflex which occurs when food enters the stomach. The ascending colon is thus emptied in order to make room for the contents of the terminal ileum, in which most of the digestion and absorption of food takes place. The faeces are conveyed as far as the pelvi-rectal flexure, where their further progress is prevented by the valvular fold of mucous membrane which separates the movable pelvic colon from the fixed rectum. The pelvic colon, which gradually fills from below upwards, thus acts as a store-house of the faeces, whilst the rectum remains completely empty.

Infants are trained to open their bowels when they are put on a chamber, no mental process being concerned in the act. In the course of time an elaborate dressing, breakfast, and finally sitting down with a conditioned reflex develops, in which getting up, a bath, newspaper and a pipe in the familiar lavatory take parts. As a result of this the biggest wave of mass peristalsis of the day occurs; the whole colon is involved and the pelvic colon empties its contents into the rectum. Distension of the pelvic colon produces discomfort in the lower abdomen, but distension of the rectum produces a perineal sensation which is the normal 'call to defæcate'. When, as a result of this conditioned reflex the faeces, collected in the pelvic colon during the previous twenty-four hours, enter the rectum, which is always empty except just before defæcation, they give rise to the call to defæcate. The diaphragm and

abdominal wall are then voluntarily contracted; and the rise in pressure within the rectum calls forth the final reflex, which results in contraction of the rectum as a whole with relaxation of the anal sphincter, through which the faeces are evacuated.

#### CAUSES OF CONSTIPATION

Constipation may result from delay in the passage through the colon—colonic constipation, or incomplete evacuation of the pelvic colon and rectum in the act of defæcation-dyschezia.

Many cases of constipation formerly regarded as colonic are caused by inefficiency of the conditioned reflex, which should result every morning in the partial evacuation of the contents of the proximal part of the colon into the pelvic colon as well as of the contents of the latter into the rectum. In the more obvious and common cases of dyschezia the conditioned reflex is unimpaired, but it is not followed by the defæcation reflex proper in which the rectum contracts and the anal sphincter relaxes, so that the rectum is found to be packed with faeces at whatever hour it is examined. This form of dyschezia often originates from neglecting to respond to the call to defæcate owing to laziness, insanitary conditions of the lavatory or false modesty. The double reflex is progressively impaired; the rectum dilates so that an increasing quantity of faeces is needed to attain the adequate internal pressure required to produce the call to defæcate, and finally the sensation is lost completely. The patient, however, is still capable of emptying his rectum if he tries, but by now he has generally convinced himself that he cannot get his bowels opened unless he takes enemas, or such enormous doses of aperients that the fluid faeces act as enemas and require no effort for their evacuation.

Dyschezia may be due to other causes, such as weakness of the voluntary muscles of defæcation, the assumption of an unsuitable posture during defæcation, and voluntary inhibition from fear of pain in diseases of the anal canal. But whatever the primary cause, the final result is the same. The defæcation reflex is lost, and the incomplete evacuation of the rectum results in the accumulation of faeces and consequent dilatation of the rectum.

#### SYMPTOMS

A great number of symptoms has been ascribed to the auto-intoxication caused by constipation. But under normal conditions little undigested protein, carbohydrate and fat reach the cæcum; the small amount of toxic products of bacterial activity absorbed from the colon and ascending colon is rendered innocuous by the liver or is rapidly excreted by the kidneys. In the comparatively rare cases of constipation, in which there is a considerable degree of stasis in the proximal part of the colon, bacterial activity is hardly greater than under normal conditions, as the quantity of food which escapes digestion and absorption in the small intestines is not increased. In dyschezia the faeces in the pelvic colon and rectum are solid, so that there is very little bacterial decomposition however long they are retained; moreover absorption can take place only from that part of the surface of the scybala which is in contact with the mucous membrane. This is in contrast with what occurs in the proximal colon, where the churning caused by the activity of the muscularis mucosæ brings all the contents into intimate contact with the mucous membrane. On the other hand, most aperients hasten the passage of chyme through the small intestine so that an abnormal quantity of undigested food and water reaches the colon, which is consequently filled with fluid or semi-fluid material. Here putrefaction and fermentation are active and the more or less toxic products are readily absorbed by the mucous membrane. Fortunately, in most healthy people the liver and kidneys are able to deal with the absorbed toxins so efficiently that toxic symptoms do not occur. If, however, aperients are taken in excess for long periods, symptoms of auto-intoxication appear, especially if the liver or kidneys are inefficient.

In dyschezia the retention of solid faeces in the rectum, which is normally empty, may give rise to a number of reflex symptoms, such as headache and general malaise, which disappear immediately the bowels are opened. The instantaneous relief proves that these symptoms cannot be due to auto-intoxication. Moreover, experimental distension of the rectum with a large plug of wool produces identical symptoms. The pressure on the surrounding parts by the retained faeces also gives rise to hemorrhoids, to perineal discomfort, and occasionally to pain which may spread to the sacral region and even down to the back of the legs.

#### DIAGNOSIS

A patient complaining of constipation should be instructed to take no aperient and to make an effort to open his bowels every morning after breakfast, even if he feels no inclination to do so. If he succeeds it is clear that he was not constipated at all and that both the local and general symptoms of which he complains are the result of purgation. If, on the other hand, the bowels are not opened, the abdomen and rectum should be re-examined. An empty colon and a full rectum indicate the presence of uncomplicated dyschezia: an empty rectum indicates the presence of inability of the colon to empty its contents into the rectum, and an attempt should be made to ascertain where the retained faeces are collected. If hard scybala can be felt in the pelvic colon through the anterior rectal wall, pelvic colon dyschezia is present. If the caecum and ascending colon are distended with soft faeces and little or no accumulation is felt elsewhere, the comparatively rare condition of ascending colon constipation is probably present. In doubtful cases the diagnosis should be confirmed and amplified by an x-ray examination carried out while the patient is not taking an aperient, but the colon should be completely evacuated by an enema the evening before the opaque meal is taken.

#### TREATMENT

In a large proportion of cases constipation can be cured by restoring to activity the defaecation reflex, which has been allowed to become inefficient by neglect and by constant interference with its normal performance through the habitual use of aperients. Simple explanation of the physiology of defaecation and encouragement is often all that is required, but it may be necessary to reduce the work the muscles of defaecation have to perform by giving liquid paraffin or an unabsorbable vegetable mucilage to increase the bulk and soften the faeces, together with a diet containing plenty of fruit and green vegetables.

The vast army of hypochondriacs, who are never happy unless their stools conform to an ideal which they have invented for themselves, can be cured only by making them realize that faeces have no standard size, shape, consistence or colour. They must learn to follow the example of the dog instead of the cat—and never look behind them.

When there is a genuine tendency to constipation, the patient should be instructed to take some kind of fruit, fresh or preserved, raw or cooked, with each meal, and green vegetables or salad with both lunch and dinner. Stewed prunes for breakfast are particularly useful. Proprietary foods containing large quantities of roughage should be avoided, as their coarse ingredients are a common cause of gastritis and they have no advantage over fruit or vegetable.

All patients with constipation, and especially those with 'greedy bowels', whose faeces are deficient in bulk, benefit from the use of substances which pass through the alimentary tract without being altered by digestive juices or bacteria and which by their bulk and consistence render the stools sufficiently large and soft to be easily propelled along the colon and expelled from the rectum. It is essential, however, that they should be of an unirritating character. For this reason psyllium seeds should never be used; they burst in water which becomes slightly syrupy, but no jelly forms, and their ends remain so sharp that they lead to considerable irritation of the gastric and intestinal mucous

membrane. They may suit canaries, but ought never to be given to human beings. Liquid paraffin and certain vegetable mucilages, which are unaffected by the digestive juices and by bacteria but absorb water to form a syrup or jelly, fulfil the required conditions. Liquid paraffin which has the disadvantages of sometimes causing flatulence and sometimes leaking from the anus, can be given in doses varying from one teaspoonful to one tablespoonful after breakfast and at night. Among the vegetable mucilages which may be prescribed are agar-agar, and the proprietary preparations isogel, coreine and normacol, all three of which form a uniform jelly with water. The usual dose is a teaspoonful once or twice a day. It is important to avoid the numerous preparations in which the beneficial effects of liquid paraffin and vegetable mucilages are more than outweighed by the irritant action of phenolphthalein and other purgatives which have been added to them.

A small proportion of patients with constipation cannot be cured without the aid of drugs. The most generally useful aperient is senna, which has the advantage of increasing the activity of the colon without affecting the small intestine. The requisite number of pods should be infused with cold water for three hours. The infusion should be drunk on going to bed, or, in individuals in whom it acts slowly, after dinner or even earlier in the day, and if experience shows that it causes any discomfort, between 5 and 15 minims of tincture of belladonna should be added to it. The number of pods should be varied from day to day till the proper dose is found—one which produces a single-formed stool after breakfast. An average initial dose is six pods. An attempt should be made from time to time to reduce the number by one at a time. By this means it is often possible to re-educate the colon to act without artificial help; a dose of ten or more pods may in this way be gradually reduced to zero.

It is necessary to warn against the indiscriminate use of every new purgative pill introduced from abroad. One of the latest to gain popularity is a preparation which is said to contain extract of intestine and extract of bile with lactic acid ferments and 0.05 gm. of agar-agar! Not one of these ingredients can have the slightest effect on the bowels. The published constitution acts on the imagination, but there must also be some active ingredient which acts on the bowel. Senna pods have the advantage over pills of all kinds in that the dose can be more accurately adjusted to the needs of the patient from day to day.

The majority of cases of dyschezia can be cured by simple re-education of the defaecation reflex, but it is sometimes necessary to begin the treatment by giving graduated enemas. When the patient is unable to evacuate his rectum by a simple effort of will although it is loaded with faeces, an enema of one fluid ounce of glycerin should be given each morning if a voluntary effort has again proved unsuccessful. The strength of the enema should be gradually reduced by replacing one fluid drachm of glycerin by an equal quantity of water every other day until only water is used. As a rule the normal defaecation reflex and with it the tone and contractile power of the rectum quickly return, but it is sometimes necessary to continue to use a dilute glycerin enema for a few weeks. When dyschezia is due to inability of the pelvic colon to empty its contents into the rectum six fluid ounces of liquid paraffin should be injected on going to bed and retained during the night; the bowels are generally opened without difficulty in the morning, and they gradually regain their normal activity so that the paraffin enemas are no longer required.

Regular exercise in the open air helps to keep the bowels active. For people who are busy all day five minutes' walk just before or after breakfast is often enough to call forth a defaecation reflex which would otherwise not occur. Exercises for the abdominal muscles, and especially of the muscles of the pelvic floor, are of great value for patient in whom dyschezia is in part due to weakness of the voluntary muscles of defaecation.



## Abdominal Pain

By W. H. OGILVIE, M.A., M.D., M.Ch., F.R.C.S.

(Abstracted from the *Practitioner*, Vol. CXXXVIII, January 1937, p. 73)

### CHARACTERS OF ABDOMINAL PAIN

SINCE pain is caused by a peripheral stimulus, but felt, after passing through three neurones, in the cerebral cortex, its quality will vary, not merely with the transmitting agent but with the receiving apparatus; that is with the mental background, courage, and general health of the patient. If no description of the nature of pain can approach to accuracy, so also no reliable method of tracing its source is available. Professor J. A. Ryle has, I think, done more than anyone of this generation to elucidate the significance of pain from the clinical as distinguished from the neurological aspect. An analysis will allow the separation, provisionally, of the following characters in any pain; its nature, its severity, its site, its periodicity, its time relations, the manner of its onset and departure, its duration, the sites if any to which it is referred, the factors which aggravate and those which relieve it.

The *nature* of any pain should permit the determination in most cases whether it has the general characters of splanchnic or of somatic pain. If it is splanchnic it may be possible to say whether it is the colic of a muscle working against difficulties or the spasm of one faced with a complete block. If it is somatic it is sometimes possible to hazard a guess as to whether the responsible stimulus is mechanical, bacterial, or chemical; for instance, whether the parietal peritoneum is being irritated by blood, pus, or gastric contents.

Its *severity* may give important information. Here each practitioner must build up his own scale of values. In my experience the pain of a perforated peptic ulcer is the most agonizing which the human being is ever called upon to withstand; it is the only one which will make a strong man drop to the ground motionless and voiceless. Second in intensity I would put gallstone colic, and third renal colic; fourth, and not certainly standing in its severity above various types of alimentary colic and peritonitis, I would put the pain of acute pancreatitis. Others would disagree. I put this grading before a meeting at which Sir David Wilkie was present, and he said that, having himself experienced both renal and biliary colic, he considered the former to be more severe. Moynihan stressed the agony of an acute pancreatitis, which I understand he put first. My experience of this disease has left me with the impression of a pain which is grievous but not agonizing, moderate when compared to the damage subsequently disclosed; indeed, the mildness of the pain, when contrasted with the patently critical condition of the patient and the evidence in the abdomen of a general peritonitis, is its chief characteristic.

The *site* of the abdominal pain will often give a clue to the site of its origin. Splanchnic pain is felt in an area which betrays the embryonic rather than the present position of the outraged viscus; mid-line organs, the alimentary canal and all its associated glands refer this pain to the mid-line, those developed laterally, that is, the genito-urinary system, to the side. Within these regions the upper portions refer their pain higher than the lower; the œsophagus to the episternal notch, the stomach, duodenum, pancreas and biliary system to the upper epigastrium, the small intestine, appendix and cæcum to the lower epigastrium and umbilicus, the large intestine to the hypogastrium, the kidney to the loin, radiating as it gets more severe to the flank and iliac fossa, the ureter to the groin and external genitals, the bladder to the suprapubic region in the mid-line. Somatic pain is felt in the area of skin supplied by the cerebrospinal nerve the sensory endings of which in the peritoneum are receiving the painful stimulus. In most cases the site of pain will correspond anatomically to the site of the lesion, but there is a notable exception in the case of the diaphragm. This is a cervical organ, drawn down into the abdomen to reinforce the efforts

of other muscles in parturition; a painful stimulus applied to the diaphragmatic peritoneum travels by the afferent fibres of the phrenic nerve and is felt in the area of distribution of the fourth and fifth cervical nerves, over the base of the neck and the acromion process.

By the *periodicity* of pain is meant its distribution in the time sense surveyed over a long interval. This periodicity is therefore of importance in the chronic rather than the acute lesions of the abdomen. Thus an almost unnoticed onset followed by a gradual increasing intensity of pain, an inexorable advance with no appreciable remissions, speaks of cancer. The pain of ulcer will occur in bouts, which rarely last less than a month, separated by intervals of freedom lasting anything from a month to several years. During the bout the pain recurs regularly day after day, with no holidays; during the intervals it leaves no reminder. Gastric pain which disappears for a day or two is rarely due to an organic lesion of the stomach or duodenum. Long remissions favour duodenal, short ones gastric ulcer. Appendicular attacks are scattered irregularly, rarely lasting less than forty-eight hours or more than a week, not often coming more than two or three times a year, and showing no constant interval. Gallbladder attacks tend to be of moderate severity at first, but to become more frequent and severe with repetition; the intervals between them obey no rule. Pain arising in the tubes and ovaries tends to follow a regular monthly cycle, usually being at its worst immediately before the period. The pain also of any inflammatory focus, such as an infected pelvic appendix or colonic diverticulum, which lies in contact with the female genital organs, will be increased by their pre-menstrual engorgement and show the same monthly periodicity.

By the *time relations* of a pain are meant its behaviour when analysed over a period of twenty-four hours, and especially its relation to environment or to the function of any abdominal viscus. The most familiar example of such a time-table is the regularity with which gastric or duodenal pain follows meals: a clock-like punctuality is suggestive that the lesion is in the stomach or duodenum, but it must be remembered that a meal is the signal for awaking peristalsis throughout the alimentary tract. The lower ileum empties into the cæcum, the colon undergoes mass peristalsis. Any lesion of the large intestine may therefore give the symptom of pain related to meals. Pain which is present on waking and disappears during the day is often due to low grade 'infection'; that coming on towards the evening to insufficient support of some unfixed and overloaded viscus. Pain which appears at week-ends suggests a slight obstruction aggravated by heavy meals; that which is only then absent is probably a spastic condition induced by overwork or mental anxiety.

The *onset* of many abdominal affections is typical. Gallstone colic comes with dramatic suddenness, appearing at any hour of the day or night, unheralded and evoked by no known circumstance, reaching maximum intensity within a few minutes of the first twinge. At the other extreme the pain of ulcer never appears suddenly, but will take anything from a week to a month to pass from the stage of discomfort after meals to that of fully developed ulcer pain. The onset of appendicitis is usually so typical, umbilical splanchnic pain followed by fixed somatic pain wherever the appendix may lie, that the diagnosis is rarely missed unless the somatic pain is absent.

The history of the way the pain *disappeared* after an attack may give a clue as to the nature of the trouble. An inflammatory lesion can only right itself gradually; the pain of an ulcer fades away as slowly as it appeared, that of an inflamed appendix can never remain severe for three days and be gone the next. A colic ceases as suddenly as it has started, but is very apt to reappear after an interval of a few hours. While the real pain of a colic stops abruptly, it often leaves a soreness behind, which the patient describes as feeling 'as if he was bruised or beaten'. This cycle—abrupt onset, abrupt termination, residual soreness—is typical of the pain caused by stones in the gallbladder and kidney.



The duration of a pain may be of considerable diagnostic value; it is much associated with the manner of onset and disappearance. Maury will remember the rhyme inscribed above many old-fashioned barometers, 'Slow come, long last; short warning, soon past'. This is also true of abdominal pain. In general, the short-lived pains are due to mechanical causes, that is, they are colics; the enduring ones are caused by organic changes, bacterial or neoplastic. This duration of the pain is often the deciding factor in the differentiation of minor pains in the right iliac fossa. Those which recur nearly every day, and last for a few minutes to a couple of hours, can hardly be due to trouble in the appendix, trouble which, while it may have a mechanical origin in a stricture or fecalith, usually has an infective element added. Their most common cause is distension by rapidly ejected ileal contents of a cecum which is unfixed, of poor tone, and inefficiently supported by flabby abdominal walls, a disease which American authors call the 'blue cecum'.

The matter of sites of reference is one to which allusion has already been made. Without denying, as Morley does, the existence of referred visceral pain, I think it is extremely infrequent. I have been unable to accept Head's areas, or to satisfy myself that the time spent in mapping out zones of hyperaesthesia would not be employed to better purpose in powdering over the significance of more important data. Real localized surface pain, tenderness, and muscular guarding are, however, of great value. Taken in conjunction with the other characters of the pain which are discussed above, it will often permit of the diagnosis not only of the exact pathological nature of the causative lesion, but of its anatomical site. Thus, when a woman who has had an attack of agonizing pain in the epigastrium, starting suddenly and accompanied by unproductive retching, later develops severe localized pain at the right costal margin near the linea semilunaris, tenderness on pressure at this spot, and rigidity of the upper half of the right rectus, it is clear, not only that she is suffering from gallstone colic, but that the element of infection is added to that of obstruction, that the gallbladder is distended, and that it is lying in contact with the abdominal wall. When a patient who for several weeks has suffered from cramp-like pains coming on two hours after meals and relieved by taking more food, starts to complain of a fixed pain over the right shoulder, it is known, not only that he has a pyloric or duodenal ulcer, but that his ulcer has become fixed by inflammatory oedema, or has actually eroded the right crus of the diaphragm.

The factors that aggravate or relieve a pain already present will often give further help. Any aggravation or alleviation of pain by the function of some organ suggests that that organ is affected by the pain-producing lesion or is in close proximity to it. Pain made worse or relieved by food probably arises in the stomach; pain only felt when the bladder is full and disappearing when the urine is passed warrants the belief that some inflamed structure, such as a diseased appendix or a pyosalpinx, is lying in contact with its walls. Aggravation by change of position presupposes a mechanical cause. The pain of a gallstone is often made worse by lying on the left side: that of a renal stone is increased by lying on the sound side and relieved by the reverse position, because the pelvis is more sensitive than the calyces. The pain of ptosis is brought on by standing and tends to become more insistent towards the end of the day; it is relieved by lying down. Sudden jolting is apt to start a renal stone on its painful downward passage.

A young Oxford blue who, owing to the presence of chronically enlarged glands in one groin was suspected of tuberculosis, suffered from recurring attacks of vaguely localized abdominal pain accompanied by severe vomiting. Repeated examination failed to disclose any abnormal physical signs, or to detect any abnormality in urine or blood count. The attacks came on at irregular intervals, and lasted from twenty-four hours to a week. After a particularly bad one which followed

a 'bumpy' aeroplane journey to Switzerland, he remembered that each previous one had been preceded by some particularly violent exertion. An excretion pyelogram revealed a small stone, of very slight opacity, lying in the right ureter one and a half inches above the bladder.

Relief of pain by emptying of a viscus, of a stomach by vomiting and of the colon by the passage of wind, points to distension of its muscle coat as the cause, and demands an enquiry into the reason behind it. Alkalis relieve pylorospasm, not only that of ulcer, but the reflex spasm due to gallstones or appendicitis.

#### CONCLUSIONS

Lastly, it must be remembered that the nerves of visceral sensation run their course along mesenteries and across ganglia, through the diaphragm and beside the thoracic vertebra, until they enter the cord to pursue further paths as yet undetermined. In each stage of this course they may be subjected to stimuli which are felt by the brain at their point of origin, much as a blow on the inner side of the elbow is felt in the little finger. The gastric crisis of tabes, the colicky attacks that accompany tabes mesenterica, are reminders that pain of true visceral type may be extra visceral in origin. Similarly the somatic nerves which supply the abdominal lining supply also its walls and the bones and joints of its framework, and pass on their way along the confines of the thorax. The errors which may arise from lesions of the anterior or posterior abdominal muscles, from diseases in the chest or spinal column or from extra-thecal tumours pressing on the posterior roots in the lower dorsal region, are familiar from books or even from bitter experience. But in the end the diagnosis will depend, not alone upon the collection and right interpretation of all possible facts, but upon the judicial shrewdness with which the facts are marshalled, the relative importance assigned to each, and the conclusions drawn. Such wisdom is not acquired from books, nor yet from discussions, but only at the bedside.

In the ultimate assessment of a case presenting abdominal pain as its main symptom, factors other than pain will influence the surgeon. Attacks of colic referred to the umbilicus, reappearing day after day but only lasting for a few minutes, unaccompanied by nausea or by recognized constipation, these indicate no more than that some part of the muscular tube supplied by the superior mesenteric artery is undergoing irregular and excessive contractions here the age will provide, not a solution, but a clue which will point a line of investigation or of tentative treatment. In a child such attacks are most commonly due to enlarged mesenteric glands, less often to some congenital defect such as a Meckel's diverticulum; in a man over fifty they suggest an early ring carcinoma of the pelvic colon. The illness of the patient, an indefinable complex which can only be assessed by the experienced eye, will often weigh in the surgeon's mind as much as the nature of the pain. I do not refer now to the cachexia of a malignant growth, though that only too often settles the diagnosis in a chronic case, but rather to the varying degrees of general impairment which are seen in the acute abdomen. A correct estimate of the condition of the patient will often settle the diagnosis in this most important type of case. In the differentiation between acute pancreatitis and impaction of a stone in an infected gallbladder, always a difficult problem, the deciding factor is that after the first hour the illness in comparison to the pain is far greater in pancreatitis than in gallstones, and the discrepancy grows with every hour.

In patients with acute peritonitis the degree of illness is of inestimable importance, for the reaction of the peritoneum to an abnormal environment depends in part on the nature of that environment, in part on the suddenness of contact. The protective reflexes of tenderness and guarding indicate that the peritoneum is stimulated, but do not show how noxious that stimulus is; the appearance of the patient will go far to answer this second query. In a diffuse septic peritonitis of recent origin, such as that from a burst

appendix, marked pain, tenderness and guarding over the affect area are found; the patient looks ill, but for some hours not desperately so. On the other hand, in pneumococcal peritonitis of similar duration, the pain and the local signs in the abdomen are less, but the general condition of the patient is one of profound intoxication. When blood is suddenly discharged into the peritoneal cavity, as it may be from a normal ovary, the pain which the patient feels over the affected area, and the tenderness and the guarding which the surgeon demonstrates are occasionally as marked as they are in limited perforation of an ulcer: but the colour, the pulse, and the general appearance of well-being of the patient belie the local signs. In blood-borne post-operative peritonitis there may be no pain at all and only the slightest tenderness when the abdominal walls are palpated. Only a rising pulse and a disinclination to move in bed draw attention to the catastrophe, but the patient's appearance leaves no doubt as to its gravity. These distinctions are not merely of theoretical interest, but of vital importance. Expectancy is the attitude towards an obstructed gall-bladder, but free drainage offers the best hope of survival in acute pancreatitis. Immediate operation is necessary for a burst appendix, but in a girl whose menstrual period has gone astray it would be foolish, if harmless.

### The Immunizing Antigens of Bacteria

(From the *Lancet*, Vol. I, 30th January, 1937, p. 274)

FROM the beginnings of bacteriology attempts were made to determine the cell-constituents of pathogenic bacteria. The early work was hampered, not so much by inadequate chemical or bacteriological technique, as by lack of a definite objective. By suitable treatment of large quantities of dead bacteria a number of more or less definite chemical substances were obtained; but their interest was chiefly intrinsic, and there was little to indicate which of them gave rise to morbid effects. With the realization that bacterial species are not necessarily fixed but undergo spontaneous or induced changes in their properties, chemical analysis had a definite question to answer. What, for example, did Pasteur's 'attenuated' anthrax bacillus lack that endowed the natural anthrax bacillus with its virulence? The occurrence of variants of a bacterial species morphologically different from their parents presented a related problem—the chemical constitution of the particular anatomical feature present in one form and not in the other. There are few easily observed morphological changes in bacteria, but they include the loss or acquisition of a capsule, and the loss of flagella. The capsulated pneumococcus was the first bacterium to be analysed in detail by chemical methods. This coccus can occur in a non-capsulated form which is relatively avirulent, and by comparative analysis of the two forms the capsular substance was found to be a complex carbohydrate, the now familiar specific polysaccharide. Each of the virulent pneumococcal 'types' differs from the other types by reason of the differing chemical structure of, among other things, these polysaccharides; and to a certain extent the behaviour of the pneumococcus in the host can be described in terms of the specific polysaccharide substance. There were, however, certain discrepancies between the properties of the polysaccharides isolated and those of similar substances present in the body fluids of the pneumococcus-infected host. It has lately been demonstrated that the relatively brutal chemical procedures to which the pneumococci were subjected during chemical fractionation removed from the polysaccharide molecule the acetyl groups, leaving a substance still capable of reacting with antipneumococcal sera, and still determining the type-specificity of the organism. Acetylation of this substance confers upon it important immunizing properties, and it appears that the polysaccharide is present in the acetylated form in the pneumococcus. The serological study of the de-acetylated polysaccharide has been particularly fruitful,

but our understanding of antipneumococcal immunity was certainly delayed because the criterion of importance adopted for the isolated substances was primarily an *in-vitro* serological one.

Flagellated bacteria (the so-called 'H' forms) of the colon-typhoid group exemplify the other main morphological variation, often throwing variants without flagella (the so-called 'O' forms). The flagella contain powerful antigens responsible for making a patient's serum positive in a Widal test, but they play a minor part only in producing disease and in stimulating immunity. The O antigens, in the body of the bacteria, are of prime immunological importance. Like the capsular antigens of the pneumococcus, they may be lost by the bacilli in certain circumstances, and the resulting variants are feebly virulent and poor in immunizing power. The adequacy of the virulent O form for the manufacture of effective vaccines was questioned by Felix, who described a new serological variant in freshly isolated, living typhoid bacilli. The variants are more virulent and better immunizing agents than the accepted typhoid strains, and Felix named the hypothetical substance responsible for their peculiar properties the 'Vi', or Virulence, antigen. This antigen is destroyed by mild heating and by the action of certain chemical preservatives used in the manufacture of vaccines. Antisera produced by horses immunized with a Vi strain are claimed by Felix and his co-workers to be effective agents in the treatment of enteric fever.

It is obviously important that the nature of an apparently powerful immunizing agent like the Vi antigen should be determined. The antigen is recognizable serologically, but the example of the de-acetylated pneumococcus polysaccharide is a warning against the common fallacy of arguing from a serological to an immunological entity. A purified end-product of chemical fractionation may be precipitated by an immune serum as effectively as a crude watery extract of the bacterium so treated, but this fact is no guarantee that the precipitated substance has remained unchanged during the process. The ultimate isolation of an immunizing substance is most safely achieved by rigid tests of all products for actual immunizing power. This method was adopted by Professor Topley and Professor Raistrick and their colleagues in their isolation of the antigens of *Bacterium typhi-murium* and has been applied to their study of the Vi antigens of the typhoid bacilli. The immunizing fraction of *typhi-murium* survived tryptic digestion of acetone-extracted bacteria, and could be precipitated from the tryptic digests. The typhoid antigens are apparently similar, and analyses, on these lines, of a Vi strain and an ordinarily virulent O form of the typhoid bacillus reveal definite and significant differences in the immunizing and chemical behaviour between comparable fractions of the two strains. The most powerful immunizing antigen is derived from the Vi strains, but the O antigens are far from ineffective in this respect, for repeated injections of the O antigen are as effective as two injections of the Vi antigen in protecting the mouse from lethal doses of living typhoid bacilli. Though Vi forms are probably the best immunizing agents, the O forms hitherto employed in the preparation of vaccines have a definite efficacy of their own.

Though the results so far obtained are sufficiently clear-cut, the exact nature of the antigens remains to be determined. The work is far from easy; one of the chief difficulties lies in the choice of suitable chemical methods of isolation. It is instructive in this respect to compare the methods used for the typhoid bacilli with those used by Dr. Stamp and Miss Hendry for the isolation of immunizing fractions of haemolytic streptococci. The typhoid fractions are polysaccharides linked on to other molecules, whereas the active streptococcal fractions appear to be protein in nature; and the dissimilarity illustrates the laborious and grouping methods of analysis that are needed for each fresh bacterium tackled. Both papers raise a point of immediate interest—the isolation of relatively

pure, stable substances capable of inducing good anti-bacterial immunity. The ease of manufacture and the effectiveness of streptococcal antitoxin have overshadowed the possible value of anti-bacterial sera. But in view of the doubts of the efficacy of streptococcal antitoxins expressed, for example, in the report of L. Colebrook, the problem of attacking the infecting cocci themselves as well as the exotoxins they produce becomes more urgent. The hæmolytic streptococci are divisible by the precipitin reaction of Lancefield into a number of sub-groups, each antigenically distinct. Dr. Stamp and Miss Hendry, in obtaining effective fractions from a streptococcus belonging to Lancefield's human-pathogenic group A, and from a cattle-pathogenic strain of her group C, have made a beginning of the immunological analysis of this highly complex group.

One more point deserves mention. Successful isolation depends on adequate assay of the products, and here the difficulties are more economic than technical. A dependable estimate of the immunizing property of a single fraction uses, if the test is to be adequately controlled, sixty mice. A complete survey of all the fractions from a bacterial analysis may require prohibitive numbers of animals. But without the foundation of the statistically significant results that follow the use of adequate numbers of test animals, very little of value can come out of immunological experiments except by happy, but scarcely dependable, chance.

### 'Phrynoderma'—A Clinical and Histopathological Study

By M. V. RADHAKRISHNA RAO

(Abstracted from the *Indian Journal of Medical Research*, Vol. XXIV, January, 1937, p. 727)

'PHRYNODERMA' is the name given by Nicholls (1933) of Ceylon to a papulo-follicular dermatosis commonly seen in malnourished individuals. The condition was first described by Frazier and Hu (1930) in China. Loewenthal (1933) in East Africa and Nicholls (1933) in Ceylon reported the occurrences of a similar follicular eruption. Investigations carried out by workers in the Coonoor laboratories have shown that phrynoderma is a common condition in South India.

#### CLINICAL FEATURES

The condition is essentially a papular eruption, the papules being situated at the site of the pilo-sebaceous follicles. They are usually present on the extensor surfaces of the arms and thighs and the postero-lateral aspect of the forearms near the elbows. In cases in which the eruption is more marked and profuse the papules are also seen on the posterior axillary folds, scapular regions, buttocks and extensor surface of the legs. The papules are hemispherical or rounded; they vary in size from a pin's head to a millet seed, and firm in consistency. Often they are aggregated in certain areas and are roughly symmetrical in distribution. On examination with a lens, a central keratotic plug may be noticed in the papules. The condition has been described as 'exaggerated goose skin'.

The onset of the papular eruption is usually slow, and subjective symptoms are absent. It is usually associated with a dry and slightly rough skin, dry hair and poor general condition; xerosis of the conjunctiva and/or 'angular stomatitis' may be seen in some instances. Most observers have described the condition as occurring in association with keratomalacia.

#### HISTOPATHOLOGY

Microscopic examination of sections of the papules shows that they arise from the mouths of the pilo-sebaceous follicles. The mouths of the affected follicles show varying degrees of hyperkeratinization of the lining epithelium. As a result, the mouths of the follicles gradually become widened and plugged by dense masses of horny tissue showing concentric lamellæ of

flattened cornified cells without nuclei. The sebaceous glands and hairs connected with the affected follicles show atrophic changes. Infiltration of mononuclear cells and fibroblasts in the loose peri-follicular tissues is often seen. This is probably the result of irritation of the horny-plug in the mouth of hair follicle.

The epidermis in between the follicles shows hyperkeratinization and, in places, moderate hypertrophy of the prickle-cell layer. Changes in the sweat glands, if any, are not marked.

The hyperkeratinization of the epidermis and hair follicles appears to be the primary pathological feature, the involvement of the cutaneous glands and hair being secondary.

#### DIAGNOSIS

The diagnosis of phrynoderma presents no difficulty. The symmetrical distribution of the follicular horny papules on the extensor aspect of the limbs in an individual showing evidences of malnutrition helps to distinguish it from other types of papular eruptions. It has to be differentiated from the following:—

(1) *Pityriasis rubra pilaris*.—Phrynoderma closely resembles pityriasis rubra pilaris. In the latter, however, the papular eruption also occurs on the dorsum of the hands and feet; red patches covered with adherent scales and separated by islands of normal skin are seen, in addition to the papular lesions.

(2) *Acne vulgaris*.—An acne-form eruption is sometimes seen on the face in phrynoderma. But the papules, unlike those in acne vulgaris, do not show pustulation. The lesions in acne vulgaris are mostly confined to the face, chest and back.

(3) *Scurvy*.—Follicular keratotic lesions similar to those seen in phrynoderma have been described in scurvy. Vascular lesions, which are, as a rule, absent in phrynoderma, are common in scurvy. Microscopically, hæmorrhages are seen in the peri-follicular tissues of the affected follicles in scurvy.

(4) *Ichthyosis follicularis: Keratosis supra-follicularis*.—In these conditions the papular lesions are irregularly and diffusely distributed. The hairs of the scalp and eyebrows are usually affected in severe cases.

(5) *Lichen pilaris: Lichen spinulosus*.—The distribution of the papular eruption in these conditions resembles that seen in phrynoderma. It is quite possible that the same condition has been described under different names.

#### COURSE AND EVOLUTION

The papules persist if untreated, though they may show slight seasonal variation. As a result of alteration in the diet they may disappear leaving small delicate cicatrices. The papules show no tendency to pustulation.

#### ÆTIOLOGY

The follicular lesions are seen in children and adults of both sexes. The exact cause of the condition is still obscure. The morphological appearances of the follicular lesions suggest that phrynoderma is due to nutritional deficiency in which lack of vitamin A is an important factor. Phrynoderma is an important clinical sign as evidence of a state of malnutrition, and is of value in assessing the 'state of nutrition' of groups of persons.

#### TREATMENT

Frazier and Hu (1931, 1934, and 1936) have observed that the eruption tends to disappear when the patients are given a well-balanced diet and cod-liver oil. Loewenthal (1933) also reports the beneficial effects of the administration of cod-liver oil and, in a few cases, of vitamin-A concentrates. Further therapeutic tests with vitamin-A concentrates are, however, necessary before the problem of ætiology is finally solved. Observations in the Coonoor laboratories have not hitherto fully confirmed the idea that phrynoderma is due to vitamin-A deficiency.

## The Treatment of Actinomycosis

By R. BATES, F.R.C.S.

(From the *Medical Press and Circular*, Vol. CXCIII, 2nd December, 1936, p. 483)

THE successful treatment of actinomycosis depends upon early diagnosis, and if the possibility of this disease is constantly borne in mind, much suffering and disfigurement can undoubtedly be prevented. Because the disease is rare it is too often allowed to suggest the diagnosis by its very chronicity. But infection with the streptothrix is not so rare as is commonly supposed, especially in cases of alveolar abscess. In a proportion of cases effective drainage of the abscess will be followed by healing. More commonly a secondary abscess will form, and perhaps a third, the pus tracking under the muscles of the face and neck, and presenting a picture very different from the typical case of actinomycosis with its induration and many sinuses.

An actinomycotic abscess of the alveolar type is due to a mixed infection, in which pyogenic organisms such as staphylococci or *Bacillus coli* lower the oxygen tension in the tissues to such a degree that the streptothrix and other anaerobic organisms can flourish. Although it is not possible for pus from every alveolar abscess to be sent for bacteriological examination, naked-eye examination of the pus in a test tube would indicate the suspicious cases which require fuller investigation.

If a test-tube containing actinomycotic pus is tilted, the colonies are visible to the naked eye as greenish-grey specks adhering to the glass. It is only in long-standing cases that the pus contains the sulphur granules so commonly described. The most important single fact in the treatment of actinomycosis is that the infecting organism is an anaerobe.

In spite of the evidence to the contrary, many textbooks still describe two different streptothrices as the cause of actinomycosis. One, acid-fast and aerobic, is commonly found on grasses. The other, non-acid-fast and anaerobic, is never found outside man or animals. The acid-fast aerobic organism is easy to culture, but does not produce the disease on animal inoculation. The non-acid-fast anaerobe is difficult to culture, requiring strictly anaerobic conditions. Animals have been successfully inoculated with a pure culture, although a suitable site, such as the vitreous of the eye, is required. The writer collected a series of twenty-nine consecutive cases of actinomycosis occurring over a period of five and a half years. In every case the infecting organism was the non-acid-fast anaerobic streptothrix. The same streptothrix has been found in the tonsils of healthy persons, and in carious teeth.

There is little doubt that the association of this disease with injuries caused by foreign bodies has been over-stressed. In the series of twenty-nine cases nothing of this sort was found. The association with the chewing of straws or grain is equally unsupported on investigation. Persons who habitually chew straws usually work among animals and so could contract the disease by direct contact with infected animals.

In the past the nomenclature has been confusing, and it would make for simplicity if the use of proper names was discontinued. The non-acid-fast anaerobe, which appears to be the cause of the disease, could then be referred to as *streptothrix actinomyces* without qualification.

In cases where there is secondary infection with pyogenic organisms, it is easy to understand how an anaerobe can grow. But it is at first difficult to understand how the streptothrix can multiply in the body in apparently pure culture. The explanation is probably twofold. Firstly, colonies of actinomycosis invariably contain a second organism, the *Bacillus actinomycetum comitans*, which can reduce the oxygen tension sufficiently for the streptothrix to grow. (If a granule is crushed and stained by Gram's method the bulk of the central Gram-positive portion of the colony is composed of large numbers of these bacilli.) Secondly, the reaction of the infected tissues results

in the formation of white fibrous tissue around the abscess resembling the process which takes place in tertiary syphilis. The blood supply is therefore progressively reduced, and with it the supply of oxygen. Any treatment which will raise the oxygen tension in the tissues is therefore a rational one.

Although the principle of treatment remains the same, the problem of affording adequate oxygenation will differ in regard to the part of the body attacked. This explains at least in part the very high mortality-rate in deep-seated actinomycosis where the disease is within the peritoneal or pleural cavities, and the very low mortality-rate in superficial actinomycosis. Another factor is the relative importance of the organs attacked. Further in superficial actinomycosis, spread is slow and by direct extension only. Infection of the blood stream with secondary abscesses in other parts of the body does not occur. The lymphatic glands are only rarely the site of the disease, and spread along the lymphatic channels does not take place. The high oxygen-content of blood and lymph streams may be a factor in preventing dissemination, as may be also the natural walling-off process. In deep-seated actinomycosis, however, spread takes place in two ways. At first by direct extension alone, and later, when abscess cavities have formed, by the blood stream. In this variety death is caused by (1) the destruction of vital organs by direct extension of the disease. The extent of such spread is illustrated by the following case: Starting in the right iliac fossa the disease infiltrated the lumbro-sacral vertebral muscles and the right crus of the diaphragm eroded the posterior surface of the bodies of the third and fourth and sixth lumbar vertebrae, and gained the spinal canal, producing an actinomycotic cerebro-spinal meningitis; (2) by generalized pyæmia. Following the formation of abscess cavities in the right iliac fossa, infection is carried to the liver by the portal vein, producing the typical honeycomb abscesses. The liver abscesses, especially in the right lobe, are so extensive that they are obviously of much longer standing than the miliary abscesses found in the lungs, kidneys, and spleen at autopsy. The inference is that the portal pyæmia is followed at a later date by systemic pyæmia, the latter proving rapidly fatal. Amyloid disease, as a result of long-continued suppuration, is to be regarded as a contributory cause of death in some cases. Perforation of the gut, when it occurs, does not cause a faecal peritonitis owing to the overgrowth of fibrous tissue. Intestinal obstruction is extremely rare.

If the diagnosis of superficial actinomycosis is made early, treatment by drainage and iodides rapidly effects a cure. The lesions in some cases are very small, and would not be diagnosed except for the presence of the colonies in the pus. A swelling the size of an almond may be noticed in association with the lower jaw, an abscess forms more or less rapidly, and examination of the pus after incision shows the streptothrix. Incision of the abscess has allowed air to enter the abscess cavity, and this will inhibit the growth of the organism. If potassium iodide is given in sufficient dosage, such a case will probably heal in three or four weeks. In early cervico-facial cases the prominent symptom is that of trismus which is out of all proportion to the size of the swelling. The bacillus of tetanus, another anaerobe, produces trismus by the action of an exotoxin, with a special affinity for nervous tissue. The trismus in cervico-facial actinomycosis is sufficiently striking to suggest a similar cause.

The well-established case of cervico-facial actinomycosis with induration and sinus formation requires protracted treatment, and relapses are frequent. The best results are obtained by the drainage of abscess cavities as they occur, and the administration of iodides. Iodides are given in the form of potassium iodide in doses up to 240 or more grains daily. A convenient method is to start with 5 to 10 grains three times a day, doubling the dose each day until the required amount is reached. Cases of iodism are certainly rare when this method is employed. The action of potassium iodide by the mouth is not understood, but it is suggested



that it stimulates the removal of white fibrous tissue and increase the local blood supply. A 1 per cent solution may be employed as local treatment, the sinuses being injected by syringe. Alternatively, iodine may be given by mouth in the form of the French tincture, min. v, t.d.s., in milk.

The use of copper sulphate has not proved so satisfactory in treatment as that of iodine. Local perfusion with a solution of copper sulphate is very painful and requires a general anaesthetic. Administered internally, copper sulphate is best reserved for cases showing marked intolerance of iodides when it may be tried in doses of g.  $\frac{1}{2}$  three times daily.

X-rays may be employed as an adjunct to the drainage and iodides. A pastille dose, repeated if necessary in three weeks, assists in fibrolysis.

Specific therapy has not been widely employed, although improvement has been reported following its use. In France a polyvalent vaccine, prepared from anaerobes present in the mouth and teeth, is being tried in alveolar cases, and good results are reported. In the same country anaerobic infections are being treated by injections of a specially prepared ozone. The treatment is a rational one, and might be applied to the treatment of actinomycosis. Ozone prepared from air is quite unsuitable because of its irritating character. When prepared from pure oxygen, however, ozone is not irritating and can be rendered more stable.

Deep-seated actinomycosis presents far greater difficulty in treatment because of the impossibility of adequate drainage and aeration. The disease is frequently far advanced before a diagnosis is made, in fact often before the patient seeks medical advice. Further, in abdominal cases the common site is the cecal area which permits an early portal pyæmia. Abdominal cases are commonly diagnosed as cases of appendix abscess, although occasionally an abscess breaks into the peritoneal cavity, and the patient is admitted to hospital with general peritonitis. Thoracic cases may be diagnosed as phthisis or empyema. As a routine procedure the pus from appendix abscess, empyema, or sub-diaphragmatic abscess should be examined bacteriologically to exclude actinomycosis. In deep-seated actinomycosis, as in the superficial forms, reliance must be placed on iodides in adequate dosage combined with the drainage of the abscess cavities. But the mortality rate is so high that any additional treatment deserves a trial. It is in the deep-seated forms that early diagnosis is of vital importance before pyæmia renders the prognosis hopeless.

### Amœbic Dysentery in Chicago

(From the *Lancet*, Vol. I, 13th March, 1937, p. 640)

LIKE pilgrims to the holy city of Benares, eight and a half million people visited the 'Century of Progress' exhibition in Chicago during the summer and autumn of 1933. They made epidemiological history, for at a cost of about a hundred lives they proved that amœbic dysentery could occur as an extensive water-borne epidemic in a civilian population. The report on this epidemic now issued is comprehensive and deserves the close attention of epidemiologists and protozoologists. Briefly, the investigations of the board of health and the division of water purification of the city of Chicago and the U. S. Public Health Service appear to have established the following facts. Two hotels, whose water-supply was partly in common, were the source of the outbreak, and two major sanitary defects were found. In one hotel cross-connections were discovered between a sewer and discharge pipes of condenser-water which, after being used for cooling, was distributed to the hotel and to the upper floors of the second hotel: in certain conditions of overloading of the sewers and heavy rain this water might become polluted by backwash up the pipes. Secondly, in the same hotel, leakage round a rotting wooden plug in an overhead sewer could contaminate a cooled drinking-water tank below.

In the previous eight years 232 cases of amœbic dysentery had been reported to the Chicago board of health. Of these, 8.0 per cent were subsequently traceable to the two hotels, and an investigation in 1926-27 had shown a carrier-rate of about 5 per cent in their employees. Of the 1,409 cases reported during the 1933 epidemic, 1,050 were among guests or employees of these hotels, and during the epidemic itself the incidence of carriers among the employees rose to 37.8 and 47.4 per cent, with a corresponding risk of pollution of the water-supply. As was to be expected from the nature of the disease there was a long latent period—averaging over three months—between exposure to infection and notification of the illness to the Chicago health authorities. The incubation period varied greatly, being most commonly about a fortnight; in a quarter of the cases it was 11 days or less; in a quarter, 12 to 20; in a third quarter, 21 to 36; and in the remainder 37 to 120. The delay in recognizing the outbreak was increased by the scattering of the visitors to their homes and difficulties in diagnosing a comparatively rare condition. Not more than 20 per cent of cases were correctly diagnosed before it became generally known that a large epidemic of amœbic dysentery had occurred, and the absence of the characteristic diarrhoea and of *Entamoeba histolytica* in many cases added to the difficulties. An acute onset with fever and abdominal symptoms led to a diagnosis of appendicitis in 16 per cent of the patients who afterwards died, and the fatality-rate in the 32 cases treated by appendicectomy was 40 per cent. The most common erroneous diagnosis in the fatal cases was malignant disease, usually of the rectum. After a correct diagnosis had been made, the results of specific treatment were very satisfactory: indeed the response to a therapeutic test is of great value in establishing the diagnosis. The chief interest of the outbreak naturally lies in the epidemiological investigations, which were exhaustive. A curious feature was the absence of the enteric fever and diarrhoea usually associated with water-borne epidemics. The explanation suggested is that the chlorine content of the Chicago water-supply suffices to prevent survival of bacteria, but not of cysts. In a later outbreak among firemen at the Chicago stockyards in 1931, in which the water consumed had escaped chlorination, amœbiasis, enteric and gastro-intestinal disorders were all noted. Control of the outbreak was attempted by elimination of carriers of cysts from the food-handling staffs, but there was no evidence that these efforts were successful. However the authors add a caveat 'that the experience in this respect is not to be regarded as an indication either of the value or lack of value of the procedure under some other conditions'.

By this unique epidemic a new hazard to civil populations has been revealed. The United States of America has led the way in personal hygiene and the careful protection of food and drink, but the Chicago outbreak of amœbic dysentery shows that in the end it is sanitation which counts, and that, as has been consistently taught in this country, an unpolluted water-supply must always be the first line of defence. Although there is less likelihood of any similar outbreak here, carriers are well known to exist, and one lesson to be learnt is that especial sanitary vigilance is needed in connection with all water-borne diseases at times—e.g., in London at the coming Coronation—when accommodation is strained and weak points in a sanitary system are most likely to be revealed.

### Benzedrine

(From the *Lancet*, Vol. I, 19th June, 1937, p. 1475)

THE many and curious effects of benzedrine, which remained unnoticed for twenty years after Barger and Dale described it in 1910, continue to attract the attention of investigators, both of the dilettante variety, who take a dose or two of the drug out of curiosity or under the stress of approaching examinations, and of the more serious kind, who write papers about it. An

annotation in these columns last year drew attention to its main effects—namely, a rise in blood pressure, a relaxation of gastro-intestinal spasm, and a striking mental change involving euphoria, loss of fatigue, heightened intellectual activity, and talkativeness. Since then Davidoff and Reifenstein have reported the effects of a 10 to 14 days' course of benzedrine on normal subjects, and on several groups of psychotic patients. The manifestations observed, both subjectively and objectively, are extraordinarily numerous and varied; it is abundantly clear that benzedrine acts very differently on different people. In the ten normal subjects, elevation of mood, over-talkativeness, and an increase in motor activity and general efficiency were the most frequent changes; if fatigue had been present it disappeared. But five of the ten developed a state of irritable restlessness which they did not relish, and from the case reports we learn that the increase of activity and efficiency sometimes involved a dangerous degree of disrespectfulness to superior officers on telephones. Fatigue sometimes appeared in subjects who had not felt it before taking the drug. A host of minor bodily sensations, pleasant and otherwise, is mentioned. In a number of the subjects, all effects diminished after the first few days, and little abnormality was observed in the second half of the period of administration. The action of the drug in the psychotic patients, many of them in depressed states, was roughly similar in kind but less in degree, and there was the same great variability. A detailed analysis led to the tentative conclusion that more stimulation occurred in patients depressed from toxic or organic

causes (such as alcoholism) than in those with purely psychogenic disorders, and to the suggestion that the drug may be of value in making the minds of depressed or self-absorbed patients more accessible to investigation or psychotherapy. No use for it, comparable to that in narcolepsy has emerged. On the other hand, Solomon, Mitchell, and Prinzmetal have produced a fair case for its beneficial effect in post-encephalitic parkinsonism. They treated 28 patients, some with benzedrine alone, and some with benzedrine and hyoscine or stramonium. Nearly all of them experienced a decrease in drowsiness, when this had been present, and an increase in energy and well-being, which was therapeutically well worth while. No clear effect on rigidity or tremor could be demonstrated, but—most strikingly—six patients who suffered from oculogyric crises lost this distressing symptom completely, and two others almost completely, under the influence of benzedrine. Since inhibition of sleep is the conspicuous central effect of benzedrine, this observation accords prettily with Sir Arthur Hall's thesis that oculogyric crises are really episodes of partial and disintegrated sleep. Solomon and his colleagues found, by contrast, that the drug was of no use in arterio-sclerotic parkinsonism or in psychotic patients with conspicuous asthenia, and out of their large experience they join other authors in giving warnings against its indiscriminate use. Its action varies so much, and the effects of its repeated use are still so little known, that caution is clearly advisable, especially in its administration to normal or relatively normal people, as distinct from those with chronic and incurable disorders.

## Reviews

**DISEASES OF THE HEART.**—By Sir Thomas Lewis, C.B.E., F.R.S., M.D., D.Sc., LL.D., F.R.C.P. Second Edition. 1937. MacMillan and Company, Limited, St. Martin's Street, London. Pp. xx plus 297. Illustrated. Price, 12s. 6d.

The first edition of this book appeared in 1933 and was reprinted twice with minor corrections. Now comes the second edition which itself shows the popularity of this production of Sir Thomas Lewis. The text has been revised thoroughly, and all recent and relevant advances in the knowledge of diseases of the heart, which would prove of value to practitioners, have been incorporated.

This is not an exhaustive treatise on heart disease, or a book of reference, but an outline of the author's clinical teachings to his own students. The information is presented in a simple and concise form.

The book is divided into thirty chapters dealing with morbid physiology, valvular diseases, irregularities and various other important diseases of the heart and vessels. It also contains adequate descriptions of pallor, cyanosis, effort syndrome, etc., on which the author himself worked. A number of illustrative electrocardiograms and orthodiagrams has been incorporated; but more emphasis has been laid upon the physical signs the demonstration of which is within the immediate reach of all.

Diagnosis, prognosis and treatment of different conditions have been dealt with. During recent years, physicians use preparations such as euphyllin extensively in coronary thrombosis, but it has not been specially mentioned in the treatment of this condition. Possibly the drug has proved disappointing and great expectations of it are not to be entertained. It is, however, useful in cardiac oedema.

The last chapter dealing with 'Diagnostic terms and summaries', 'Conversing with the patient and his friends', etc., will interest beginners.

Two diets have been given at the end of the book for guidance in the management of grave congestion and in convalescence without exercise.

The book provides the fundamental principles of circulatory derangement as they are understood to-day and will prove very useful to physicians and senior medical students.

R. C.

**RECENT ADVANCES IN PULMONARY TUBERCULOSIS.**—By L. S. T. Burrell, M.A., M.D. (Cantab.), F.R.C.P. (Lond.). Third Edition. 1937. J. and A. Churchill, Limited, London. Pp. viii plus 320, with 48 plates and 22 text-figures. Price, 15s.

We are glad to welcome a third edition of this excellent book which needs no introduction to students of phthisiology. The plan of the book has remained the same but most of the chapters have been re-written and new chapters on infectivity and immunity, childhood tuberculosis and bovine tuberculosis and on classification and types of tuberculosis, including chronic miliary tuberculosis have been added. Tonographic interpretations have been included in the chapter on radiology. No less than five chapters, out of fourteen, have been rightly devoted to treatment, medical and surgical, chemotherapy and the author's experiences with different salts of gold have received dispassionate criticism. Forty-eight skiagrams illustrating normal and abnormal conditions of the lungs and pleura have been conveniently inserted towards the end of the book.

Dr. Burrell's book has been noted for a level-headed but up-to-date opinion which will be found to be useful for senior students and general practitioners alike. Dr. Burrell thinks, for various reasons adduced by him, that 'the so-called childhood type of tuberculosis is essentially the same as the adult type' and that 'children have as much resistance to tuberculosis as adults have'. Other workers may not agree with this view but the author's views are entitled to the greatest respect.

The printing and get-up are excellent and reflect credit on the publishers.

A. C. U



**MEDICAL RESEARCH COUNCIL. REPORTS OF THE COMMITTEE UPON THE PHYSIOLOGY OF HEARING: IV.—THE USE OF HEARING AIDS.—**  
By A. W. G. Ewing, I. R. Ewing and T. S. Littler.  
Special Report Series, No. 219. Published by His Majesty's Stationery Office, London. 1936. Pp. 40. Illustrated. Price, 9d.

'THE accurate study of deafness is a development of recent years and is a product of the great advances in sound reproduction and recording associated with telephone-engineering and broadcasting. It might be thought that the success in amplifying sound that has been achieved in these directions would solve the problem of defective hearing in a simple manner, but this is far from being the case. The general increase in intensity of sound is only one aspect of the problem, as individual deaf persons vary in the extent to which they are deaf to different pitches of the auditory range. The object of any hearing-aid is, therefore, so to modify sound as to bring it within the range of hearing which the individual retains.

The extent to which a patient is in need of hearing-aid, and the kind of aid which is most suitable, can be ascertained by audiometer tests to an extent which was previously impossible. Workers trained in the education of deaf people to the use of hearing-aids can nowadays discover and indicate to the individual patient the circumstances in which an aid will give him valuable help and those in which it will give him little or none. In this way the assistance that can be given to the deaf has been greatly increased.

It is interesting to note that, in the present study, the results obtained by testing patients for a series of pure tones by means of the audiometer provided a reliable index of the intelligibility of speech to the deaf listener. Special attention was also given to the type of amplifying apparatus which produced the best results in deafness, and to the question of the relative merits of teaching groups of children by a class amplifier, into the microphone of which the teacher speaks, or by an individual aid for each child. It was decided that the class amplifier has a number of advantages over individual aids.

Among other things, the authors of the report show, by the results of their investigations into auditory fatigue, that hearing-aids are safe to use, and are not themselves the cause of any further deterioration in the power of hearing. The authors also lay stress on the value of proficiency in lip-reading as a supplementary aid to the understanding of speech.'

**MEDICAL RESEARCH COUNCIL. THE USE OF THE DEVELOPING EGG IN VIRUS RESEARCH.—**  
By F. M. Burnet. Special Report Series, No. 220. Published by His Majesty's Stationery Office, London. 1936. Pp. 58. Illustrated. Price, 1s.

'THIS report, issued by the Medical Research Council on the recommendation of their Bacteriology Committee, deals with a method which has proved of much value in the study of human and animal diseases due to infection with filter-passing viruses. It is a method, moreover, which may come to have still greater importance, both in research work and in practical applications to prevention and treatment. One of the chief obstacles to the investigation of these ultra-microscopic organisms has been the failure of attempts to grow them in artificial culture media, such as are commonly used with success in the case of visible bacteria: research on viruses has therefore depended entirely on their maintenance by constantly repeated passage from animal to animal. In these circumstances there has been good reason to welcome the discovery that many viruses can be propagated in the chorio-allantoic membrane of the embryo chick in the developing egg.

The report assembles a great deal of recent work on this subject. It reviews the results of scientific importance which have already emerged from use of the method, shows the lines on which further advance is

now being made, and indicates that with certain viruses there may be useful practical applications.

The whole of the work is of quite recent development. The chorio-allantoic membrane of the developing chick was used by Rous and Murphy in 1911 for studies of fowl tumours, and since then it has been applied also to tumours from other species. In 1931 Goodpasture and Woodruff showed that this egg-membrane was a very favourable site for the study of virus infections, and that a number of viruses—fowl-pox, vaccinia and herpes febrilis—could be propagated thereon in indefinite series. In the past five years a mass of work has been published, from various sources, showing that this membrane is unusually receptive for many viruses. Just as the membrane will nourish heterologous tumour grafts which will not grow in the fully developed bird, so many viruses will multiply freely in the membrane or in the embryo although these viruses may not be infective for chickens or fowls. The resistance of the embryo to virus infections is imperfectly developed, and it may be lowered still further by incubating the inoculated eggs at an abnormally low temperature. The list of virus diseases which can infect the developing egg is so long and so varied that it comes almost as a surprise to find that there are certain viruses which cannot grow under these conditions.

Developing eggs may be used with advantage in many instances to replace experimental animals. Thus many viruses may be propagated, free from visible bacteria, on eggs; and a suspension of virus may be titrated with ease in this way. In those cases where the virus produces focal lesions, methods akin to "plating" may be employed: counts of the foci are possible, and with adequate precautions the egg-membrane technique will give more precise information than the more usual laboratory animals. Assays of the potency of antisera may be made and, as a recent development, Burnet and Keogh have used this technique in some important studies of the mode of action of antisera on viruses. The membrane also offers exceptionally favourable conditions for histological studies of the lesions induced by virus infections: its normal structure is so simple that any reaction to infection can be readily studied, and the development of special features of virus disease, such as "inclusion bodies", can easily be followed in some detail. Fertile eggs are comparatively cheap and require the minimum of attention: moreover, the risk of accidental cross infection—the bug-bear of the study of virus diseases in experimental animals—is reduced to a minimum, for the virus in the inoculated egg is as securely enclosed as bacteria are in test-tube cultures.

From the practical standpoint it is clear that vaccinia virus, free from contaminating bacteria, can be produced rapidly for the vaccination of man, either as a routine measure or in an emergency such as smallpox epidemic. This has been shown to be feasible but it remains doubtful whether the method will supersede the orthodox calf-lymph which has for long served mankind so well. It is probable that the egg-membrane could be used to grow quantities of virus for the manufacture of vaccines for other diseases, human or animal, but this has not yet been tested.

A very interesting possibility emerges from the continued passage of viruses in eggs. The author of the report has himself shown that influenza virus changes its character on prolonged egg passage, so that while remaining virulent for the egg-membrane it loses its virulence for the ferret and mouse. Yet the avirulent strain preserves its immunizing properties. If these characteristics can be perpetuated, the value of such a strain for the immunization of man is obvious. Caution is necessary, however, as the very fact that a virus strain has once altered its character shows that it is unstable, and that reversion to the original type might occur unexpectedly.

Two strains of laryngo-tracheitis virus were isolated from fowls in Victoria and studied on egg-membranes. These strains were so mild that they produced no symptoms at all, or only slight illness, when inoculated into

susceptible birds; and yet the recipients of the avirulent virus were completely immunized against infection with other strains of full virulence. Serological tests indicated that a large proportion of the Victorian fowls had undergone an immunizing infection with this avirulent strain, and the absence of epizootics of this disease in Victoria is thus explained. This important information could only have been secured by the egg-membrane method, and the possible usefulness of an avirulent strain of virus is strikingly exemplified.

**MEDICAL RESEARCH COUNCIL. REPORTS OF THE HEARING COMMITTEE: V.—HEARING AND SPEECH IN DEAF CHILDREN.**—By P. M. T. Kerridge. Special Report Series, No. 221. Published by His Majesty's Stationery Office, London. 1937. Pp. 137. Illustrated. Price, 2s.

'This report by Dr. Phyllis M. T. Kerridge is issued by the Medical Research Council on the recommendation of their Hearing Committee. The report describes the results of an investigation made by her into the hearing and speech defects of a group of school children. Dr. Kerridge is a physiologist, with a medical qualification, who has been well trained in the methods of pure science: she therefore approaches the problem of deafness from a different angle from that of the aural surgeon.

The deaf are among the neglected of medicine. Too often nothing can be done to diminish their deafness by medical treatment, and all that remains is to mitigate the disability by means of instrumental help or special education. Deaf children have long been understood and educated by specially trained teachers. Deaf adults, misguided by advertisements, have usually been left to wander unadvised to purveyors of hearing-aids. Often they become disappointed, introverted and bad-tempered. Both children and adults need more help from medical science than has been their share in the past.'

**HOME CARE OF THE MENTAL PATIENT.**—By Dr. Arle Querido. 1936. Oxford University Press, London. Humphrey Milford. Pp. 91. Illustrated. Price, 2s. 6d. Obtainable from Oxford University Press, Bombay and Calcutta

ALTHOUGH this little book makes interesting reading, it seems very doubtful whether a mental patient can ever be treated to advantage in his (or her) own home. On the other hand, and this is a point Dr. Querido does not mention, there is no doubt very many mental patients can be treated with considerable success in homes other than their own. This aspect of psychotherapy Dr. Querido does not make clear. It is almost inconceivable that he has never heard of that extraordinary township Gheel, near Antwerp, which is entirely given up to the treatment of the insane in the families of its inhabitants. In spite of his name, it would appear that the author is a Dutchman, since he is the head of the Department of Social Psychiatry in Amsterdam, and therefore not very distantly situated from Gheel. It would be impossible to recommend this book too highly to any philanthropic person who desired to undertake the care of a mental patient provided that the patient is in no way a relative.

O. B-H.

**MODERN PSYCHOLOGY IN PRACTICE.**—By W. Lindesay Neustatter, B.Sc., M.B., B.S., M.R.C.P. 1937. J. and A. Churchill, Limited, London. Pp. xv plus 299. Price, 10s. 6d.

THE author of this book proclaims himself to have not only a sense of humour but a good deal of that sense so frequently termed 'common' in spite of the fact that it is so rare. Further, his sense of humour has taught him to value his dignity too much ever to stand on it. The best portion of this truly fascinating book is that devoted to the consideration of the nervous disorders of children and their treatment. In his discussion of the time-worn theme of nature versus nurture, Dr. Neustatter considers, and probably very rightly, that

environment can only adversely influence a child's mind that is already unstable. He has some hard things to say about parents but so has everybody who has ever attempted to deal with refractory children. We may wholeheartedly subscribe to Dr. Neustatter's view that lying in children is either a very serious problem or a slight one. In respect to what has come to be termed 'pathological lying', Dr. Neustatter does not seem interested. This is to be deplored as the pathological liar is a very dangerous and troublesome member of society. Of its most striking form, i.e., false self-accusation, Dr. Neustatter makes no mention. The author criticises with considerable acumen some of the modern methods of treatment of psychopathic children, particularly the 'play therapy'. There is an interesting chapter on vocational guidance by Jack Jennings wherein the reader is shown to what extent vocational guidance has rendered, and continues to render, benefits to those who have taken the trouble to consult the National Institute of Industrial Psychology. Dr. Neustatter is wholly correct in emphasizing the importance that in dealing with neurotic patients the physician must be entirely *amoral*. One of the many difficulties in the practice of psychiatry is that, by the very nature of the material it is dealing with, it tends to become involved in the realm of ethics. On no account must a doctor who is treating patients psychologically attempt to convert them to his own ideas. So to do is to increase the feeling of unworthiness from which the neurotic already suffers. As regards the part psychology can play in the treatment of so-called 'physical' disorders, Dr. Neustatter shows an almost excessive bashfulness. Anyhow, he has reached at least one basic conclusion, namely, that surgeons can be nasty rough fellows. One wonders how long it took him to find this out! The book concludes with a chapter on Crime and Insanity but with no hint as to the majestic folly of the law when dealing with so-called 'insanity'.

O. B-H.

**DIATHERMY: INCLUDING DIATHERMOTHERAPY AND OTHER FORMS OF MEDICAL AND SURGICAL ELECTROTHERMIC TREATMENT.**—By Elkin P. Cumberbatch, M.A., B.M. (Oxon.), D.M.R.E. (Camb.), F.R.C.P. 1937. Third Edition. William Heinemann (Medical Books), Limited, London. Pp. xvi plus 576. Illustrated. Price, 21s.

THIS is the third edition of Dr. Cumberbatch's well-known book. Its publication has been rendered necessary by the advance that has been made in the knowledge of diathermy, diathermotherapy, and the surgical uses of high frequency currents. It includes new sections on short wave treatment and inductothermy.

In writing the present volume the author has been assisted by nine collaborators. The necessity for this division of labour is due to the large amount of clinical knowledge which has been acquired in the treatment by diathermy methods of diseases of the special regions, and the increasing employment of the cutting arc.

Mr. A. H. Burgess has written the chapter on electrosection. Mr. Douglas Harmer has described the use of diathermy in the surgical treatment of diseases of the upper air passages. Mr. Kenneth M. Walker has written the section on the treatment of enlarged prostate. Dr. C. A. Robinson has contributed two chapters on the employment of diathermy in gynaecology and chronic arthritis. Dr. H. Wallace Jones has written a chapter on treatment of diseases of the cardio-vascular system by diathermy and short waves. Dr. Norman Bell Graham has given his experience in the treatment of dementia paralytica by therapeutic fever. The late Dr. Dan McKenzie wrote the chapter on the use of diathermy for destruction of the tonsils.

The physical principles underlying the employment of high frequency currents, especially the currents of enormously high frequency that are employed in short waves and inductothermic treatment, are dealt with in a chapter by Mr. H. J. Taylor, a physicist.

Oct., 1937]

## REVIEWS

The general heading *Electrothermic methods* is suggested for the various forms of treatment described in the book in succession to diathermy, which is not sufficiently comprehensive.

This heading would include the three surgical forms of electrothermic treatment, electrodesiccation, electrocoagulation, and electrosection. The term diathermy is reserved for the oldest and best known variety of heating by high frequency currents.

The newer forms of medical electrothermic treatment are called 'short wave therapy' and inductothermy. As it stands this book is the most complete and authoritative work on these methods extant. In keeping with all the author's publications the style is clear and concise. The deductions are unbiased and uncoloured by the author's prejudices, if he has any. The whole theme has an air of British fairness and solidity about it.

J. A. S.

**THE PRACTICE OF IONIZATION.**—By J. N. Dyson, M.R.C.S. (Eng.), L.R.C.P. (Lond.). 1936. Henry Kimpton, London. Pp. xvi plus 178, with 9 illustrations. Price, 6s.

This little book written from experience extending over many years is bound to appeal not only to the general practitioner, but to others who are practising electro-therapy.

As an introduction to the subject, the volume can be highly recommended. The style is clear and concise. The chapters on the physical problems concerned and descriptions of the necessary apparatus are very simple and can be mastered by anyone of ordinary intelligence in a very short time.

Many distinguished authorities will not subscribe to the author's theory of medical ionization, viz. that the effects are entirely due to the current, or migration of the tissue ions, and that there is no evidence of the introduction of therapeutic ions into the tissues. The truth probably lies between the two. Ions introduced into the skin may form insoluble compounds and become fixed, or may be carried away by the blood stream and appear at distant points (iodine in the urine in potassium iodide ionization).

In any case, as a working hypothesis, the former theory will help the beginner most. The chapters on the treatment of various diseases will be of considerable interest to the general practitioner. They are written entirely without bias and will help him to decide what kind of case is likely to respond to this form of treatment.

The fact that Dr. Cumberbatch, a renowned authority, has consented to write a foreword to this little book is in itself a sufficient commendation to the medical profession.

J. A. S.

**THE NORMAL ENCEPHALOGRAM.**—By L. M. Davidoff, M.D., and C. G. Dyke, M.D. 1937. Henry Kimpton, London. Pp. 224. Illustrated with 149 engravings. Price, 25s.

The importance of x-ray examination of the head, after injection of air or other gas into the cavities of the brain, in the diagnosis of diseases of the central nervous system has been recognized for some years. One of the main difficulties in the interpretation of the skiagrams, however, has been the absence of an authoritative work on the normal appearances and their correlation with the living anatomy of the brain.

This is the gap which the book under review would appear to fill. The material covered includes a description of the technique, which by the way has been greatly simplified by the authors' indications and contraindications for the performance of the test and the reactions of the patient before, during and after the injection.

The main part of the book is concerned with what the authors call *encephalographic anatomy*—the anatomy of the living brain and its coverings, as revealed

by the contrasting shadows of tissue and gas in stereoscopic skiagrams.

In the first chapter the authors distinguish between ventriculography—injection of air or gas into the ventricles through the fontanelle or trephine hole and encephalography—injection into the subarachnoid space by the lumbar or cisternal route. Ventriculography is only used when there are signs of increased intra-cranial pressure.

Encephalography is recommended for all other cases and is usually performed by the lumbar route. There are 149 engravings in 208 pages, a fact which will give some idea of the profuseness of illustration. All the skiagrams are reproduced in an excellent manner, lettered and arrow-marked to show the appearances corresponding to anatomical features.

This is a book essentially for the expert radiologist and neurologist and it can be thoroughly recommended for inclusion in the libraries of such specialists.

J. A. S.

**HANDBOOK OF DIETS.**—By R. M. Simmonds, S.R.N. Second Edition. 1937. William Heinemann (Medical Books), Limited, London. Pp. ix plus 171. Price, 7s. 6d.

This book is a very practical one written by a dietitian of the Hammersmith Hospital. The diets, recipes and tables which occupy most of the book will be found useful by all concerned with the care of the sick. The caloric value of nearly every diet has been given, which undoubtedly increases the practical utility of the book. Numerous diets, such as Sippy, gastrosomy, typhoid, ketogenic, various diabetic, salt-free, protein (high and low), calcium and pregnancy diets, are given, with their food values. The last chapter deals with infant feeding and diets suitable for various diseases of childhood.

The tables include standard heights and weights, chemical composition of food, Lohertz diet, etc. The language is simple and the book will prove useful to nurses and non-qualified dietitians as well.

We can strongly recommend this book as a book of reference containing as it does analyzed diets applicable to a wide range of medical conditions.

R. C.

**DIETS AND RECIPES AND THE TREATMENT OF DIABETES AND OBESITY.**—By E. P. Poulton, M.A., D.M. (Oxon.), F.R.C.P. (Lond.). 1937. Published by Oxford University Press, London. Humphrey Milford. Pp. xii plus 121. Illustrated. Price, 7s. 6d. Obtainable from the Oxford University Press, Bombay and Calcutta.

The book deals mainly with diet in diabetes and casually with the dietetic treatment of obesity. Some of the organic constituents of food such as vitamins and purines as well as some of its important mineral constituents have also been dealt with. Besides the dietetic treatment, the author has briefly described the general management and treatment of diabetes and its complications.

The main feature of the book, however, is that a series of over 200 recipes are included which have been made up so as to have a fixed composition and a definite caloric value. This will be of value not only to the dietitian but also to the patient, who can thus have a large variety of choice in the selection of his food when the composition and the caloric value of the diet have been prescribed for him by his physician.

J. P. B.

**MEDICINE FOR NURSES.**—By W. Gordon Sears, M.D. (Lond.), M.R.C.P. (Lond.). Second Edition. 1937. Edward Arnold and Company, London. Pp. viii plus 435. Illustrated. Price, 8s. 6d.

This is the second edition of this book and it contains a veritable field of vision and knowledge for the student nurse.

The subject-matter is arranged in a most concise and clear manner rendering the most difficult points so much easier to understand.

The system of paragraphing is most helpful, the methods described are all very up to date, and there are sections dealing with every branch of nursing in the field of medicine.

We heartily recommend every student nurse to procure a copy of this very excellent textbook from which to study. The clinical picture of each disease as depicted by the author makes each chapter a really thrilling story for the interested nurse.

E. M. C.

**CHRONIC RHEUMATIC DISEASES: BEING THE THIRD ANNUAL REPORT OF THE BRITISH COMMITTEE ON CHRONIC RHEUMATIC DISEASES APPOINTED BY THE ROYAL COLLEGE OF PHYSICIANS.**—Edited by C. W. Buckley, M.D., F.R.C.P. Number Three. 1937. H. K. Lewis and Company, Limited, London. Pp. x plus 131. Price, 10s. 6d.

THE British Committee on Rheumatic Diseases appointed by the Royal College of Physicians submit this third annual volume of reports. It has been most judiciously edited by Dr. Buckley with a foreword by Professor Fraser.

The object of these reports is to present an account of clinical and laboratory observation and research, together with a survey of the work which is being carried out in different countries. Treatment from various aspects receives special attention in this volume.

Professor Okell, writing on 'Vaccines and rheumatic arthritis', states that streptococci are seldom found in joint lesions and there seems no convincing evidence that the disease has been cured by vaccine treatment. Professor Learmonth in 'Sympathectomy in arthritis' explains that such operations, though capable of giving rise to symptomatic relief, cannot affect the underlying disease process. Dr. Kahlmeter has contributed an article on 'X-ray treatment in rheumatic diseases' and Dr. Race on 'Vitamins and rheumatic diseases'. Reviews of other forms of therapy are 'Diet in arthritis' by Dr. Buckley, 'Chrysotherapy in arthritis' by Dr. Tegner, etc. Dr. Hench of the Mayo Clinic has written a synopsis of recent American investigations on diseases of joints and related structures.

Drs. Archer and Discombe have pointed out the dangers that can arise from the administration of such commonly used drugs as phenacetin, amidopyrin and cinchophen. Dr. Jennings has found that sodium salicylate is efficacious in gouty arthritis and in daily doses of 80 grs. caused notable excretion of uric acid. Such therapy is also free from the toxic risks inherent in cinchophen treatment.

A number of abstracts and reviews of the French, German and Italian literature by Drs. Pether and Bach, given at the end of the book, are welcome contributions.

The book is likely to prove useful to all who are interested in rheumatic diseases.

R. C.

**TRIAL OF BUCK RUXTON.**—Edited by R. H. Blundell, Barrister-at-Law, and G. H. Wilson, M.D. 1937. Butterworth and Company, London. Pp. lxxxvii plus 457. Illustrated. Obtainable from Messrs. Butterworth and Company (India), Limited, Calcutta. Price, Rs. 6-8.

This book has been placed in the 'Notable British Trials' series. It is of interest to the medical profession in two respects, viz, the chief actor in the drama was a medical man, and the work of identification of the bodies was carried out by highly-skilled medico-legal experts, who called to their aid a pathologist, an anatomist and a dentist.

The processes of reconstruction of the dismembered bodies, the parts of which had been mixed up, was very ingeniously carried out and will serve as a guide to medical men called upon to carry out similar work. It

is also anticipated that in the near future this extremely interesting portion of the book, which is in several appendices, will be made use of by writers of thrillers.

P. A. M.

**THE CONTROL OF TUBERCULOSIS IN ENGLAND: PAST AND PRESENT.**—By G. G. Kayne, M.D., M.R.C.P. (Lond.), D.P.H. 1937. Oxford University Press, London. Humphrey Milford. Pp. xlv plus 188. Price, 8s. 6d. Obtainable from Oxford University Press, Bombay and Calcutta

DR. GREGORY KAYNE, who has been a Dorothy Temple Cross research fellow in tuberculosis, has done a distinct service to public health workers and general practitioners by publishing this volume, to which a very appreciative foreword has been written by Sir Humphry Rolleston.

The text is divided into three parts. The first deals with the treatment and prevention of tuberculosis prior to 1908. This year marked the intervention of the State in its official recognition of the importance of the disease by the Public Health (Tuberculosis) Regulations, making notification of tuberculosis compulsory in patients in poor law institutions and in those under the care of district medical officers. To effect this, England possessed, at the end of 1908, 3,900 beds in public sanatoria and hospitals, excluding the provision made by the poor law authorities. The evolution of and the relation between the poor law organization and the voluntary system of general and special hospitals and dispensaries on the one hand and the sanitary authorities on the other are skillfully traced in chronological order. It is interesting to note that the first Anti-tuberculosis Dispensary was opened in England (Paddington) 21 years after Sir Robert Phillip had demonstrated it in Edinburgh (1887) and 10 years after the establishment of the National Association for the Prevention of Tuberculosis in that country (December 1898). It is also interesting to note that Sir Robert Phillip stressed the importance of 'after-care' colonies as early as 1907.

The second part traces in detail the progress of tuberculosis control since 1908 and shows the inhibitory influence of the war and the post-war economic crisis. It appears that no organized control of tuberculosis by the State existed in England before 1908. At this time the State began to act as an adviser to sanitary authorities. The National Insurance Act of 1911, rightly called 'the greatest social measure of the present generation', forthwith offered 14 million people medical and sickness benefit, including sanatorium benefit (1912). The evolution of compulsory notification from the voluntary method and the evolution of the tuberculosis scheme whereby the co-operation of dispensaries, institutions and general practitioners was ensured, have been well explained. The evolution of these schemes was temporarily checked during the Great War, but things began to move quickly when the Ministry of Health was established in 1919 and a special department solely concerned with tuberculosis was set up. The Public Health (Tuberculosis) Act of 1921 marked another milestone in the administration of tuberculosis. The Public Health Act of 1935 further consolidated the work by enforcing the Ministry's memorandum 37/T, further rules for notification were issued and by 1927 rules for the supervision and employment of tuberculous workers in workshops were introduced. Between 1914 and 1925, various acts and orders were enforced for controlling bovine infection by the registration of dairymen and supervision of dairies and cattle.

The third part includes a full discussion of the problem as it presents itself to-day, points out the shortcomings and indicates the possibilities of improvements in the future. A short résumé of recent advances in our knowledge of tuberculosis and their relation with tuberculosis schemes have been well elucidated.

The story of the remarkable reduction in tuberculosis mortality in England since 1850 has been very ably written, supporting the statements with statistics at the end of each chapter. The control of tuberculosis has

assumed world significance. The present publication is, therefore, a timely one, for which all tuberculosis and public health workers ought to remain grateful to Dr. Kayne. The publishers are to be congratulated for the excellent printing and get-up.

A. C. U.

**THE CONTROL OF BOVINE TUBERCULOSIS IN MAN.**—By N. Raw, C.M.G., M.D., M.R.C.P. 1937. Ballière, Tindall and Cox, London. Pp. viii plus 128, with 12 plates. Price, 6s.

This small volume represents the personal experiences and views of Dr. Nathan Raw on the important question of the control of bovine tuberculosis, with special reference to English conditions. In view of the recent findings regarding the isolation of the bovine type of tubercle bacillus from lung lesions in adults, the opinion of Dr. Nathan Raw is likely to be challenged from several angles.

For example, his ideas about the mutation of tubercle bacilli from the bovine to the human type are not likely to be accepted by many workers. He believes, like the late Professor Calmette, that infection in children occurs by ingestion of bovine bacilli in milk, that these bacilli lie dormant in the human tissues for many years, probably 8 to 10 years, gradually transmute themselves to the human type and then produce pulmonary tuberculosis. He also believes that glandular and osteo-articular tuberculosis and lupus are of bovine origin, being conveyed by milk. As only a certain fraction of these cases is due to bovine tubercle bacilli, it appears to us that this statement is rather dogmatic and not warranted by facts. In India, where bovine tuberculosis is comparatively rare, 99 per cent of the cases of extra-pulmonary tuberculosis, including lupus, are due to the human type of the tubercle bacillus.

In view of the high percentage of tuberculous dairy cows in England, the author rightly stresses the importance and urgent need of a safe milk supply for school children. He advocates pasteurization as an excellent procedure and suggests his own method of artificial immunization of calves with vaccines prepared from killed cultures of an attenuated and avirulent strain of human tubercle bacilli obtained in 1906. He claims that he has obtained good results in experimental animals. He further advocates the use of this vaccine in the prevention and treatment of human tuberculosis. He also advises the introduction of attested herds for a safe milk supply.

Although experimental evidence will not support the author in some of his views on the bacteriology and pathology of tubercle bacillus infection, it is gratifying to note that his object in writing the book 'to direct attention to the danger of the tuberculous cow' has been very well achieved. The book makes stimulating reading and we recommend it to the attention of both medical and veterinary workers. There are some unnecessary repetitions which, we hope, the author will eliminate in the next edition.

The printing and get-up are excellent.

A. C. U.

**LEPROSY—HISTORY, AETIOLOGY, BACTERIOLOGY AND PATHOLOGY.**—By L. Whitaker, M.D., and Ashutosh Roy, L.M.F. Published by Purulia Leper Home and Hospital, Purulia, Bihar. Pp. 17. Price, As. 8.

In this short book the author gives much valuable information which a leprosy worker should know. The history of leprosy of the world, the different views about its causation and the pathological findings are discussed briefly.

It would have been better if an explanatory note had been added to the diagram illustrating the factors upon which depend the development of the disease in contacts.

There are some printing mistakes and irregularities. Owing to these and the many abbreviations used certain portions of the book are rather difficult to understand.

In the authors' words 'There is no claim made to originality, the pamphlet simply representing the results of reading and experience gained in the work of the colony (Purulia Leper Home and Hospital)'.

**LEPROSY TREATMENT (A SUMMARY).**—By Lorno Whitaker, M.D. Published by the author from Purulia Leper Home and Hospital, Purulia, Bihar. Pp. 16, with 3 appendices. Price, As. 8.

It is only recently that medical men in India have begun to take an interest in leprosy. Dr. Whitaker, in his attempt to help the doctors who are doing leprosy work, has summarized the different methods of treatment in leprosy and has appended a list of prescriptions which his predecessor used in Purulia Leper Home and Hospital.

The book gives much useful information about the preparation of esters, causes of pain after injection, line of routine treatment and treatment of complications.

There are printing mistakes here and there which have made some portions unintelligible. Abbreviations have unnecessarily complicated the matter and some of them such as 'max. 10 c.c.' or 'PAT 2 c.c.' may be difficult for the new practitioner to understand.

**THE PRACTICE OF MEDICINE.**—By J. C. Meakins, M.D., LL.D. 1936. The C. V. Mosby Company, St. Louis. Pp. xv plus 1343, with 505 illustrations including 35 in colour. Price, \$10.

This is a well-written book on general medicine. It consists of 1343 pages and 505 illustrations of which 35 are in colour. It is rather unusual for the ordinary textbooks on medicine to be so profusely illustrated, and this in fact is a special feature of the book. The clinical descriptions of the various diseases are very well done and all useful information is contained in them. The treatment of some of the diseases could have been dealt with a little more elaborately and it would then be of greater interest and usefulness to the medical practitioner. At the end of each section one finds a long list of references pertaining to the subject and this is indeed a valuable addition which will be greatly appreciated by those who are specially interested in any of the sections. Considered as a whole the book is an excellent one and is recommended particularly for the use of students and practitioners.

K. V. K.

## Abstracts from Reports

**ANNUAL REPORT OF THE HEALTH OFFICER OF THE MUNICIPALITY OF GEORGE TOWN, PENANG, STRAITS SETTLEMENTS, FOR THE YEAR 1936**

*Population, births and deaths.*—The estimated mid-year population was 165,411.

There were 5,975 births, the birth rate being 36.12 per thousand. The figures for 1935 were, births 5,452 and birth rate 33.61.

The gross total of deaths within municipal limits during the year was 3,659 and crude death rate 22.12.

Compared with 1935, the Chinese deaths have decreased by 43 and the Indian deaths by 7; the Malay deaths have increased by 58.

*Maternity and child welfare.*—During this year by the appointment of a lady assistant medical officer and the opening of another centre, a real beginning has been made at last in a maternity and child-welfare scheme for Penang municipality.

The infant mortality rate for 1936 was 126 as against 148 in 1935.

*Vaccination.*—The municipal staff did 3,523 vaccinations of which 3,281 were primary and 242 secondary. In addition, Government vaccinators during the year performed 131 primary vaccinations and 1,451 secondary vaccinations, mostly in schools, while 1,034 primary



vaccinations were performed by private practitioners. No serious results were reported.

*Anti-mosquito works.*—During 1936 the town has been exceedingly free from mosquitoes with no very marked periodical increase.

The total oil consumption for the year was 88,000 gallons of anti-malarial mixture, the cost being \$14,437.50.

*Tuberculosis.*—The slight increase in the number of deaths from this disease may be accounted for by several factors, an important one of these being an increase in population adding to the overcrowding in already congested areas. There was a continuation in the improvement of unhealthy areas, supervision of common lodging houses, and the removal of as many as possible of the small ill-ventilated cubicles which crop up overnight often in houses already unfit for human habitation. From time to time in the annual reports, preventive measures are reiterated, and it is to be deplored that tuberculosis is still, apart from 'unspecified fever', our highest cause of mortality.

*Enteric fever.*—Sixty cases were reported, i.e., 13 more than the number reported in 1935.

#### ANNUAL PUBLIC HEALTH REPORT OF THE CENTRAL PROVINCES AND BERAR FOR THE YEAR 1935

*Estimated population.*—The estimated mid-year population for the year 1935 was 16,359,986 showing an increase of 122,279 during the twelve months.

*Births and birth rate.*—The total number of births registered during the year was 696,804 giving a birth rate of 44.93 against the quinquennial average of 45.25. The rate of natural increase of population, i.e., the excess of birth rate over the death rate, was 10.58.

*Deaths and death rate.*—Five hundred and thirty-two thousand, seven hundred and forty-eight deaths were registered, giving a death rate of 34.35 per 1,000 of population. As compared with last year, the number of deaths, crude and corrected death rates, shows a diminution by 44.387, 2.87, and 2.98, respectively. This is a welcome feature.

*Infant mortality and rates.*—The mortality among infants under one year of age was 155,766 or 233.54 per 1,000 births, against the quinquennial average of 231.52.

*Deaths from child-birth.*—There were 5,521 deaths from child-birth, of which 960 were registered in municipal and other towns and 4,291 in rural areas. It corresponds to one maternal death to every 84 urban and 144 rural live births. As in the previous year, there is higher maternal mortality and infant mortality in urban areas than in rural districts for reasons stated previously.

*Still-births.*—The total number of still-births registered during the year was 15,950, showing a decrease of 215.

#### CHIEF DISEASES

*Cholera.*—The disease broke out in January and assumed an epidemic form in March. Out of 39,374 attacks 20,140 died or a case mortality of 51.15 per cent.

The chief preventive methods adopted were propaganda (by lecture and magic lantern demonstrations), inoculations and disinfection of water supplies.

*Plague.*—There were 7,966 attacks with 793 deaths or a case mortality of 10.02 per cent. The disease was of a mild form.

The chief preventive measures adopted were destruction of rats, inoculation and evacuation. The total number of inoculations performed was 20,888.

*Smallpox.*—There were 15,479 attacks and 2,802 deaths from smallpox during the year or a case mortality of 8.10 per cent.

The disease was prevalent in a virulent form throughout the year in the province, except in the months of September, October and November.

Preventive measures chiefly consisted of vaccination and revaccination.

*Malaria.*—Total number of deaths recorded from this cause was 269,249, out of the provincial total of 532,748

from all causes, corresponding to a death rate of 17.36. This shows that malaria was responsible for 50 per cent of the total provincial mortality. This calls for serious attention. As stated in the previous year's report, arrangements are being made to distribute 3,500 pounds of quinine received from the Government of India in hyper-endemic areas of the province.

*Fairs and festivals.*—Special arrangements were made with regard to disinfection of water supplies, conservancy and isolation and treatment of infectious cases. A special feature was propaganda.

No epidemic disease was reported at any of the fairs, except at Bhandakpur fair in the Saugor district, where cholera broke out.

The *maternity and child-welfare* movement made steady headway and this was reflected in the reduction in the infant mortality rate during the year. Child-welfare centres increased to 64 (57) and the total attendance rose to 495,724 (451,852). Any intensive drive in this direction must await an improvement in the financial position, but it is gratifying to note this movement has come to stay and activities like baby week shows and health exhibitions have become a permanent feature of the public health propaganda in the province. The Health School continued to send out trained health workers who are bound to raise the standard of maternity work in the province.

#### THE REPORT ON THE PUBLIC HEALTH ADMINISTRATION OF THE PUNJAB FOR THE YEAR 1935

*Vital statistics.*—The main feature of the public health report for the year 1935 is the estimate that the population of the province has increased by nearly half a million. The exact figure of the increase as calculated is 485,299, which is the highest on record. The estimated mid-year population was 25,022,053 which is 1,561,786 more than the census figures of 1931. The number of births registered was 1,069,138, the highest number yet recorded, and the birth rate per mille was the highest of any province in India. The number of deaths on the other hand shows a decrease of 65,936 on the figure for the previous year, and it is significant that though the number of births was unprecedented the number of deaths among children under one year of age was 9,978 less than in the previous year. In fact the infant mortality rate was also the lowest on record. The year was a particularly healthy one for the rural areas where the death rate was the lowest recorded for many years.

Commenting on these figures the Director of Public Health considers that the year 1935 was the healthiest within living memory and claims that the figures show the results of the improvement brought about by the activities of his department during recent years, both in controlling the prevalence of infectious diseases and in improving the environment of the infant by maternity and child welfare work. This may well be so, but if the population of the Punjab is to go on increasing at the rate of half a million a year without a proportionate increase in the economic resources of the province a deterioration in the general standards of living, low as they are already, is inevitable. The time is rapidly coming when the public health department and other authorities concerned will have to give serious thought to this aspect of the question.

#### PRINCIPAL DISEASES

*Cholera.*—There was a moderate increase in cholera the number of cases rising from 279 in 1934 to 1,293 in 1935, and deaths from 178 to 714. The infection was brought into the Punjab from other provinces where there were severe epidemics, the number of deaths recorded in the United Provinces, Central Provinces and Bengal running into many thousands. Infection was more persistent in the towns than in rural areas and the report shows that if the disease is to be eradicated the main requirement is an improvement in urban sanitation on a scale which is not yet practicable. The districts most affected were Attock, Lahore and Karnal.



**Smallpox.**—The number of deaths from smallpox was 1,822 showing a slight increase of 130 over the figure for the previous year. About 48 per cent of these deaths were those of children between the ages of one and ten years and the department is carrying on a vigorous propaganda for the revaccination of children of these ages. The general campaign of vaccination proceeded satisfactorily and 3½ million operations were performed at a total cost of Rs. 3.88 lakhs. The report draws attention to the need for more adequate infectious diseases hospitals in the larger cities and the question of using the provisions of the Municipal Act by which municipal committees can be required to provide such hospitals of a suitable type, is receiving the consideration of Government.

**Plague.**—The incidence of plague remained low and in spite of a severe epidemic in the United Provinces there were only 1,085 deaths in the Punjab. This is no doubt largely due to the intensive deratting and disinfecting campaign carried out in the previous off-season and the efforts of the department to suppress the disease where it appeared. The districts most affected were Hoshiarpur and Ambala.

**Other diseases.**—Fever, including malaria, showed some decrease, and as anticipated there was no severe malaria epidemic. The malaria forecast proved to be accurate and enabled the department to concentrate its energies on those areas where in fact the disease developed. There were more deaths (200 against 152) than in the previous year from cerebro-spinal fever, but somewhat less from dysentery. Deaths from respiratory diseases increased from 55.6 to 58.8 thousands. The report shows the difficulties experienced in estimating the incidence of tuberculosis owing to difficulties of diagnosis in the early stages. There is certainly a widespread belief that it is spreading and the ten thousand deaths from tuberculosis of the lungs which were reported during the year indicate, though perhaps inadequately, the extent of this menace. Fortunately the interest of the public has been aroused and private charity is coming to the rescue. Two institutions, the tuberculosis institute attached to the Mayo Hospital, Lahore, and the sanatorium at Samli in the Murree hills, which have recently been opened owe their existence mainly to the beneficence of private subscribers. It is hoped that this example will be shortly followed at Amritsar.

The anti-hookworm campaign was continued in the Gurdaspur district, where 72,571 persons were treated during the year. A sum of Rs. 10,000 from the allotment made by the Government of India for rural development was granted for the construction of bore-hole latrines in the district. A survey of this disease was also carried out in seven districts.

Eighteen new leprosy clinics were opened during the year bringing the total to 52 besides the five clinics at the leper homes. The leprosy survey was extended to five more districts. The Punjab Government now has under consideration a scheme for making an agricultural settlement for burnt-out leprosy cases in the Lower Bari Doab colony and it is hoped that this will make more accommodation available for active cases in the leper homes.

**Urban sanitation.**—The report of the superintending engineer, public health circle, of the public works department gives a full list of the works under construction by that department on behalf of municipal committees. Good progress was made on the Montgomery drainage scheme (estimated cost Rs. 5,97,290) and the intramural drainage system was completed. In the Okara drainage scheme (estimated cost Rs. 2,51,167) the outfall system and collecting tanks have been completed and the sullage pumping station is nearing completion. The Okara water-supply scheme was practically completed by the end of the year. The Bhiwani drainage scheme (estimated cost Rs. 4,44,403) made good progress and the intramural drains were nearly finished. The Sialkot drainage scheme (estimated cost Rs. 4,49,881) was completed. The superintending engineer again comments on the failure of local bodies to maintain their sanitary and

water-supply works in proper condition and Government hopes that his repeated efforts to keep municipal authorities up to the mark in this matter will not remain unheeded. It is satisfactory to note that the Jullundur drainage scheme is an exception to the general rule and is well maintained. Government note that some of the smaller municipalities have achieved some success in introducing the system of metered private connections for water supply and hope that the larger municipalities will follow suit. The report shows that there has been little or no improvement in the arrangements for the removal and disposal of refuse and street sweepings, with the result that diseases borne by flies such as cholera are particularly difficult to check in urban areas.

**Rural sanitation.**—The sum of Rs. 2,16,918 was granted by the Government of India for carrying out water-supply schemes in eight rural areas, and a further Rs. 40,930 was allotted to district boards by the local Government through the sanitary board for similar purposes. The Director of Public Health is satisfied that the intensive propaganda carried on in villages in recent years is bearing fruit and that the sanitation of rural areas is steadily improving. A measure of the success achieved is indicated by the imposing list of manure pits dug, ventilators sold, village drains constructed and streets paved. In addition a great deal of untubulated work is done by the officers of the public health and other departments, under the stimulus of the Commissioner for Rural Reconstruction, in village clean-ups, *safai* weeks and health propaganda. If the zemindar does not keep his village clean in these days it is not for want of good advice.

**The Punjab Pure Food Act.**—The Act was in force in 332 local bodies, of which 27 employed the public health chemist as public analyst. It is disappointing to see that only 13 of these sent any samples of food for analysis and the total number of the samples sent only amounted to 126, of which 68 were of ghee and 33 of milk. It is not known how many samples were dealt with in those municipalities which employed their own public analyst. Enquiries go to show that in most local bodies to which the Act is extended, little effort is made to enforce the Act. The Director of Public Health has been asked to stimulate the municipal medical officers of health, who are generally the inspectors under the Act, to greater activity. It would be of interest if special mention was made in future annual reports of the success achieved in enforcing the Act.

**Maternity and child welfare.**—The number of health centres in the province at the close of the year was 76, 13 new centres having been opened during the year. The centres are managed by local bodies or associations and Government paid Rs. 25,000 in grants-in-aid to various centres. The work of the inspectress of health visitors and health centres is rapidly increasing and Government has now sanctioned the post of an assistant inspectress. The number of *dais* under training at various health centres at the close of the year was 1,758 and 350 passed the examination for indigenous *dais*. The registration of *dais* under the Nurses Registration Act has also made progress and a number of local bodies have now found it possible to make by-laws under the Act forbidding the practice of unregistered *dais*.

#### ANNUAL RETURNS OF THE HOSPITALS AND DISPENSARIES IN BIHAR AND ORISSA FOR THE YEAR 1935. BY COLONEL P. S. MILLS, I.M.S., INSPECTOR-GENERAL OF CIVIL HOSPITALS

**General.**—The forms for the annual returns on hospitals and dispensaries were revised and the new forms were brought into use in 1935.

The total number of hospitals and dispensaries on the 1st January, 1935, was 690. One class III and two class VII dispensaries were closed and one class II and two class III dispensaries were opened during the year.

action it is superseding the older forms of digitalis medication. 'Tabloid' digoxin and solution of digoxin, for oral administration, and 'Hypoloid' digoxin, a sterile solution for intravenous injection, were on view.

A description of the exhibit would not be complete without mention of the comprehensive range of 'Tabloid' medicine chests and cases and 'Tabloid' and 'Hypoloid' hypodermic pocket-cases which was shown. Many years of experience in this type of work has made these equipments outstanding examples of compactness and utility.

## MAGNESIA

### ITS DISTINCTIVE AND COMPARATIVE VALUE

MAGNESIA is one of the simple remedies which has received the undisputed sanction of practitioners. In its present form, magnesia was first sold as a cure-all by a canon at Rome, in the beginning of the 17th century, under the title of 'Magnesia Alba' or 'Count Plama's Powder'. For a long time, the mode of preparation of this substance was a closely guarded secret.

In 1707, Professor Valentini of Giessen, Germany, published a process of its manufacture, the substance obtained being a mixture of carbonates of magnesia and lime and in varying proportions. Constant investigations into this new remedy resulted in preparations of magnesia in varying degrees of purity.

Until 1873, magnesia and *magnesia alba* were used only in their solid forms. In that year, Mr. Charles H. Phillips, a New York chemist, invented a concentrated liquid magnesia under the title 'Milk of Magnesia', the safest and most dependable form of laxative-antacid.

Magnesia in the colloidal state is highly active. As an antacid, Phillips' milk of magnesia will neutralize almost three times as much acid as a saturated solution of bicarbonate of soda and fifty times as much as lime water. It has a further advantage over carbonated alkalies in that it is free from carbonic acid and is a gentle yet efficacious laxative.

## VIROL LIMITED

### CHILDREN'S DIETARY REQUIREMENTS

#### *Extended use in Public Health Services*

THE LORD LUKE, K.B.E., Chairman of Virol Limited, speaking at the 37th Annual General Meeting of the Company said that an interesting feature of the year's work has been the effect of the series of investigations on 'The Value of Certain Supplements to the Diet of Children' recently published in the medical press.

This report, which excited widespread interest throughout the medical profession, has led to a further considerable increase in the use of Virol in the various departments of the Public Health Services.

The problem of research on the part of food manufacturers is daily becoming more and more important.

Mr. Arthur E. Canney, Managing Director, referred to the research carried out by the scientific staff, and stressed the growing importance of continued research on the part of food specialists in connection with their various products.

It was recognized, of course, that there were many factors other than diet that played their part in the physical well-being of the individual; for instance, it had been conclusively proved that the average child can derive much benefit from increased hours of rest, particularly in summer. But an eminent authority had recently stated: 'It has now become clear that diet is the most important single factor influencing general health and development'.

Much emphasis had been laid upon the necessity of the education of the public in dietary problems; but the factors to be taken into account in providing an optimum diet are now so numerous and diverse that it was beyond the capacity of the average housewife to provide meals which would comply with all the precepts of science. Add to this the complications that

the nutritional needs of herself or her husband cannot be the same as those of her schoolboy son, or her baby girl, and it is immediately apparent that her difficulty cannot be solved by a process of education.

It was not surprising, therefore, that investigations had shown the diet of children in general to be inadequate to produce ideal growth and development.

The only solution capable of widespread application was the provision of a suitable supplementary food. The efficiency of such a supplement depended on three fundamental considerations. First, its composition must be scientifically calculated to contain an adequate amount of those factors most likely to be deficient in the home diet. Secondly, each stage of its manufacture must be under careful scientific control. But, above all, its value must be proved by direct experiment, under exactly the same conditions as those prevailing in its intended field of application.

Clinical experience over a period of 40 years has shown that Virol successfully fills this rôle, and the recently published investigations to which the chairman had referred confirmed the experience of the medical profession.

### A CORRECTION

WE regret that in our July number on p. 456 the word 'Tabloid' was inadvertently used in the heading on a note concerning a product not manufactured by Messrs. Burroughs Wellcome and Company. The word 'Tabloid', as is well known, is a proprietary word belonging to this firm.

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## Original Articles

### THE INCIDENCE OF *CLOSTRIDIUM TETANI* IN THE SOIL OF CALCUTTA

By C. L. PASRICHA

MAJOR, I.M.S.

Professor of Bacteriology and Pathology  
and

G. PANJA, M.B. (Cal.), D.B. (Lond.)

Assistant Professor of Bacteriology

(From the Bacteriological Department, School of  
Tropical Medicine, Calcutta)

Sixty samples of soil collected from different areas were examined for the presence of *Clostridium tetani*. The samples were collected during the pre-monsoon hot weather and the methods employed in the isolation and study of the cultures were on the lines found satisfactory by Fildes (1925a and b). A summary of the methods employed is outlined below:—

Approximately 2 to 3 c.cm. of ground-up soil were added to 10 c.cm. of freshly-prepared blood-broth (nutrient broth enriched with 2 per cent of pepsin digest of blood). The tubes were well shaken and incubated under aerobic conditions at 37°C. for four days. On the fifth day two big loopfuls of inoculum were removed from the tubes and inoculated into the condensation water of peptic-blood-agar slopes (which had been kept upright in the incubator overnight in order to allow of sufficient drying of the surface of the medium). The inoculated blood-agar slopes, were incubated under anaerobic conditions in McIntosh and Fildes' jar at 37°C. for four days. Any growth occurring at the apex of the slope was examined and subcultured into the condensation water of another tube and incubated anaerobically. *C. tetani* under these conditions grows as a rapidly-spreading film on the surface of the medium and the fact that this character of spreading growth is more pronounced in the case of this bacterium than with other anaerobes was taken advantage of by Fildes in his method of isolation of *C. tetani* in pure culture. Although in the majority of the isolations the second tube showed a pure growth of *C. tetani* (a fine transparent filamentous growth often difficult to detect with the naked eye) a third tube was inoculated from the topmost area of growth. If now the growth appeared to be contaminated, purification was done by inoculating further tubes of peptic-blood-agar slopes in the same way. In certain strains of tetanus bacilli no spores were seen even after four days' incubation. This delayed formation of spores at first caused some difficulty in the recognition of the cultures and more reliance was placed on the characteristics of the growth than on the morphology of the cells in the non-sporing condition.

When a growth resembling that of *C. tetani* was obtained subcultures were made and after a

study of the cultural characteristics and the morphology of the cells the final identification was made by the agglutination and pathogenicity tests.

The agglutination test was made with a high titre serum prepared with a standard toxigenic laboratory strain. The titre of the serum for its homologous strain was 1 in 1,600. Phenolized and heated saline suspensions of a density equal to that of Brown's opacity tube no. 2 were used for the actual test. The agglutination tubes were kept in the water bath at 55°C. for 18 hours and the readings taken with the unaided eye. Agglutination, when it occurred, was of the large loose floccular type readily visible, within one hour.

The pathogenicity test was carried out with all the strains isolated. Unfiltered seven-day-old peptic-blood broth cultures (grown anaerobically) were injected in doses of 0.25 c.cm. intramuscularly into two series of mice. One series of mice had received previously 40 international units of tetanus antitoxin.

As our results of the examination of colony characteristics and the morphology of the cells are in complete agreement with those obtained by Fildes it is unnecessary to record them in this report. Cultures resembling those of *C. tetani* were obtained from 51 or 85 per cent of the 60 samples of soil examined. Five of these strains, although they resembled tetanus bacilli in their cultural characteristics and in the morphology of the individual cells, were neither agglutinated by our serum nor were toxic to mice.

These strains were excluded from the series. The remaining 46 strains that were isolated killed mice with the development of general tetanus and typical spasms. Forty-two animals died within 24 hours; in four, death was delayed from three to four days. The mice injected with anti-tetanus serum showed complete protection. In view of the uniform toxicity of these strains for mice, a series of ten strains was tested for toxicity on guinea-pigs. Half a c.cm. of seven-day-old cultures was injected intramuscularly into a series protected with 400 international units of tetanus antitoxin and an unprotected series of guinea-pigs of approximately uniform weights. Six of the ten guinea-pigs died within 24 hours with typical general tetanus, two died in 48 hours, one three days after and one six days after the inoculation.

Thirty-four or 75 per cent of the 46 strains of tetanus bacilli isolated were well agglutinable (either to full titre or nearly full titre) with our tetanus high-titre serum. Nine strains were in-agglutinable (1 in 25) with the high-titre serum used. As the results of the protection experiments were so clear cut and showed that all the strains isolated were toxigenic tetanus bacilli, further serological investigation was not undertaken.

(Continued at foot of next page)

## FURTHER EXPERIENCE WITH TETRACHLORETHYLENE.

By P. A. MAPLESTONE, D.S.O., D.Sc., M.B., Ch.B., D.T.M.  
and

A. K. MUKERJI, M.B. (Cal.)

(From the Helminthological Research Laboratory,  
Calcutta School of Tropical Medicine)

MAPLESTONE and Mukerji (1929) published a report on the use of tetrachlorethylene in which they gave doses of 3 c.cm. either alone or combined with 1 c.cm. of oil of chenopodium and they obtained a cure rate of 20.7 per cent with a single treatment. In this instance the drug was supplied in soft gelatin capsules and some cases were treated by giving the capsules, whilst in others the capsules were cut open and the required amount shaken up in a saline purgative. On account of its apparent inefficiency we abandoned the use of this drug for the time but for reasons that are given in Maplesstone and Mukerji (1933) a second trial of it was made. On this occasion it was supplied in bulk and not in capsules, a dose of 4 c.cm. combined with 1 c.cm. of oil of chenopodium was given and this time we cured 62 per cent of cases in one treatment and a further 12 per cent with two treatments.

Regarding the marked differences in these two series of results, a subsequent observation which has not before been published was made. A tin containing a number of unused capsules from the first lot of tetrachlorethylene supplied was left unnoticed in a cupboard and when it was opened three or four years later the capsules were found to be collapsed and empty. It appears possible that even in the relatively freshly filled capsules a part of the very volatile tetrachlorethylene had evaporated. Whether this explanation is correct or not it seems clear that soft capsules of the type used on this occasion are not reliable containers for tetrachlorethylene for any length of time. Lane (1935) commenting on our results says '..... that the better results are those which may be expected in future cannot be accepted without further

(Continued from previous page)

### Summary.

Sixty samples of soil collected from different parts of Calcutta were examined for the presence of *C. tetani*. In 46 or 77 per cent of the samples examined toxigenic strains of *C. tetani* were isolated. This suggests the very general distribution of tetanus bacilli in the soil of Calcutta and stresses the real need for adequate prophylactic use of tetanus antitoxic serum.

### REFERENCES

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investigation'. This, in the absence of the above or any other explanation, is reasonable, but it does not seem a fair statement of the case that when our work is cited as evidence of the value of tetrachlorethylene only the inferior figures are quoted, as has been done in the *Tropical Diseases Bulletin*, Vol. 34, top of page 456.

Our previous work dealt with relatively few patients who were all in-patients, but the present series are out-patients so they will be of more value for purposes of comparison by workers treating the infected members of a labour force. We have done no egg counts either before or after treatment because we have long been of the opinion that egg reduction gives an entirely erroneous idea of a drug's efficiency, and moreover as the ideal in hookworm treatment is to cure as many cases as possible with a single dose, establishment of cure by the most accurate method available is the only factor worthy of consideration in estimating the value of an anthelmintic.

### Hookworm infection

Ninety-six cases were treated with 3 c.cm. of tetrachlorethylene combined with 1 c.cm. of oil of chenopodium\* shaken together in two ounces of saturated sodium sulphate solution. For children and obviously undersized adults the above doses were proportionately reduced by calculating, in the case of tetrachlorethylene, the adult dose  $\times \frac{\text{age}}{\text{age} + 12}$ , and for the oil giving one minim for each year of age up to the age of 16.

The patients were given their mixture in a small bottle and instructed to shake it well and take it at once early the next morning. The figures we give below have been obtained by this method and as we have entirely to rely on the word of the patients that they have taken all or perhaps only a part of the dose, it is possible our figures are not as good as they might be under closer supervision, but at all events our results cannot give an erroneously high percentage of cures.

A number of persons failed to return after departing with their first treatment; these have of course been ignored. Of the 96 who returned at least once after an interval of ten days 43 or 44.8 per cent were cured with one treatment and an additional ten (shown in table I as 'scanty eggs after one treatment') showed only one or two eggs by the D. C. F. method, so they were not considered worth treating further. If these are added to our absolute cures we get 53 or 55.2 per cent of what we will call 'practical' cures. After two treatments twelve

\* We have always used oil of chenopodium from reliable drug manufacturers and it has never contained below 60 per cent ascaridole. Since its standardization and inclusion in the pharmacopœia the oil we have used has contained 65 per cent ascaridole, which is the minimum standard allowed. The results in this paper have been obtained with oil of chenopodium B.P.

did not return and are shown in the table as 'not cured in one treatment', 14 were absolutely cured and 6 were practically cured. The total number given two treatments was 31 so there were 45 per cent cured, and it accordingly seems fair to estimate that we would have cured six out of the twelve who did not return, therefore our total cures in two treatments may be taken as  $43 + 6 + 14 = 63$  out of 96 or 65.6 per cent. In the case of 'practical' cures after two treatments we can say we cured 20 out of 31 so can estimate we would have cured eight out of the twelve who did not return, therefore our practical cure rate for two treatments is  $43 + 10 + 8 + 14 + 6 = 81$  or 84.4 per cent. If we apply the same method to the results of three treatments we find 68.7 per cent absolute cures and 93.7 per cent practical cures.

Twenty-six of the above cases had ascaris infection in addition and we found that we had cured 18 in a single treatment so it seems clear that this mixture is a good one where both hookworm and ascaris are present.

A second series of 90 cases who all had an uncomplicated hookworm infection were treated with a full adult dose of 4 c.cm. of tetrachlorethylene, or less if under age. It was given in the same way as the former treatment and 50 or 55.5 per cent were absolutely cured after a single treatment while 61 or 67.7 per cent were practically cured. Using the same method as above of estimating the number of cures in those who did not return after their second or third treatments respectively we find that after two treatments 63 or 70 per cent were absolutely cured and 77 or 85.5 per cent were practically cured, while after three treatments 70 or 77.7 per cent were absolutely cured and 85 or 94.4 per cent practically cured.

TABLE I

	Tetrachlor- ethylene and cheno- podium	Tetrachlor- ethylene
Number treated ..	96	90
Number cured in one treatment.	43	50
Number with scanty eggs after one treatment.	10	11
Number not cured after one treatment.	12	9
Number cured after two treatments.	14	9
Number with scanty eggs after two treatments.	6	2
Number not cured after two treatments.	4	1
Number cured after three treatments.	4	6
Number with scanty eggs after three treatments.	2	1
Number not cured after three treatments.	1	1

For purposes of comparison the percentages of cures after one, two or three treatments with the two methods, and which are given in the text, are shown in table II.

TABLE II

Number of treatments		Tetrachlor- ethylene and cheno- podium	Tetrachlor- ethylene alone
1	Absolute cure Practical cure	44.8 55.2	55.5 67.7
2	Absolute cure Practical cure	65.6 84.4	70.0 85.5
3	Absolute cure Practical cure	68.7 93.7	77.7 94.4

From these figures it appears that tetrachlorethylene in doses of 4 c.cm. is slightly better than 3 c.cm. combined with 1 c.cm. of oil of chenopodium. It has already been stated that the full dose was not given in all cases as some were under age but that the difference cannot be explained by any marked difference in the numbers receiving full doses in the two series is shown because 60 had the full dose of tetrachlorethylene with 58.3 per cent of cures after a single treatment and 61 had the full combined dose with 45.9 per cent of cures. This also indicates that reduction in dose on account of size of the patient has only a slight effect on the cure rate.

#### *Tænia solium* and *T. saginata*

In recording the results of the treatment of tænia infections with carbon tetrachloride Maplestone and Mukerji (1931) mention trying tetrachlorethylene in three cases of *T. saginata* infection with apparently no effect, so it was not continued. On this occasion the original gelatin capsules were used. After the much better results with tetrachlorethylene in treating hookworm infection, recorded in 1933, we again made use of tetrachlorethylene for tænia, and up to the present have treated 26 cases.

These patients are always treated as in-patients so that the whole stools can be saved to see if the head is passed. If we fail to find the head in the stools passed in the forty-eight hours following treatment the patients are discharged and asked to report three months later, if there is no recurrence of the worm. Four of the patients passed heads after treatment and nine others reported three to five months after discharge from hospital and with three exceptions there had been no recurrence. That is out of 13 cases traced 10 were cured. Of the four who passed heads two were *T. saginata* and two were *T. solium*, both of whom were experimental infections and incidentally the only cases of



*T. solium* seen. These figures, although small, show that tetrachlorethylene is a fairly efficient drug for removing tapeworms, and when it is recalled that it is given in exactly the same way as we have described for hookworm treatment the simplicity and absence of precautions needed make a strong claim for its universal use in treating ordinary tapeworm infections.

#### *Enterobius vermicularis*

The number of drugs that have been claimed as a cure for this infection is legion so one hesitates before naming still another one. The reason so many drugs have been considered cures is probably that this infection is usually short-lived provided reinfection is prevented, and also finding the eggs or worms is not easy, so a much reduced but not cured infection may be missed at the re-examination. With these facts in mind we give our results of treatment with tetrachlorethylene in *E. vermicularis* infection.

All the patients in this series were treated as out-patients in exactly the same way as the hookworm cases. The preliminary diagnosis was made by D. C. F. which is not very much used, so stools negative to this method were washed through fine sieves and worms searched for in the residue. This work was done by experts thoroughly accustomed to it so very few if any worms would be missed. The patients were asked to bring one whole stool, they rarely did so but usually between 50 and 100 grammes were brought and the whole of it was washed. The same procedure was followed ten days after the treatment and the cases negative at this second stool examination are put down as cures. Most of the cases were in children so that only four had the full dose of 4 c.cm. and eleven had 3 c.cm., all the others had less.

We treated 42 cases and 27 or 64.3 per cent were cured with one treatment. Of the 15 treated six were cured, two were not cured, and seven did not come for re-examination. If we take our cure rate in the second treatment as six out of eight we can allow for five cures out of the seven who did not return so that the total number cured in two treatments can be estimated at 38 out of 42 or 90 per cent.

#### *Trichuris trichiura*

This worm is hardly ever found in Calcutta in large numbers if one judges by the number of eggs in stools, but its incidence is fairly high. We made no special investigation as practically no cases with this infection alone were seen, but we kept a record of the presence of trichuris eggs in the stools before and after treatment for the other worm infections and although it is not possible to give actual figures, because often in the first place the eggs were so few that repeated examination might be needed to demonstrate them even with D. C. F., we have come to the

conclusion that tetrachlorethylene is of little if any value in removing these worms.

#### Discussion

As the patients discussed in this paper were, with the exception of the twenty-six tapeworm cases, given their treatments to take at home we cannot on this occasion comment directly on the toxicity of tetrachlorethylene, but our continued use of it among in-patients for the last six years and the questioning of the out-patients lead us to affirm our earlier opinion on the safety of this drug. It may be argued that the patients who did not come back failed to do so on account of the objectionable effects of the treatment, but this would be only supposition not capable of proof and quite unlikely in view of our general and long experience of this remedy in cases we have observed, so it would be of little value as an objection.

On account of the relatively few workers engaged upon large-scale organized hookworm control at the present time, the accumulation of statistics regarding treatment with tetrachlorethylene on anything like the same scale as those collected in two or three years for oil of chenopodium and carbon tetrachloride, when the Rockefeller Foundation were working almost wholly on this subject, is taking a long time. But recently Faust (1937) stated that over 100,000 treatments have been given without a death so we who have advocated the use of this drug on account of its safety, among its other advantages, may almost consider our opinion is amply confirmed.

In this inquiry it has not been possible to give details of the species of hookworm involved but from our experience extending over many years in Calcutta, in cases where we have been able to examine the species of worms evacuated, it is fairly safe to assume that *Necator americanus* outnumbered *Ancylostoma duodenale* by about three to one.

#### Summary

The figures produced in this paper confirm the fact that our earlier result recording 62 per cent of cures with tetrachlorethylene is much nearer the truth than our first results which were only 20.7 per cent and an explanation of the apparent failure of the drug on this occasion is offered.

Results of treatment of tænia and enterobius infections are also recorded.

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## NON-TUBERCULOUS AFFECTIONS OF THE LUNGS CONFUSED WITH PULMONARY TUBERCULOSIS

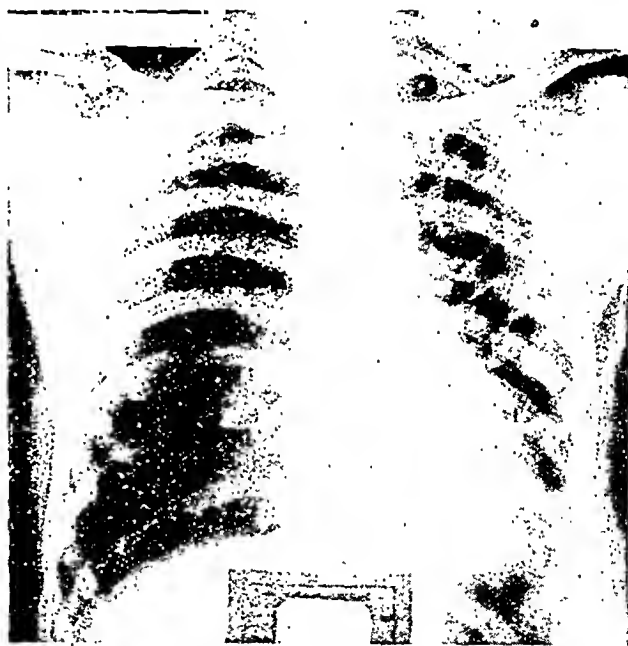
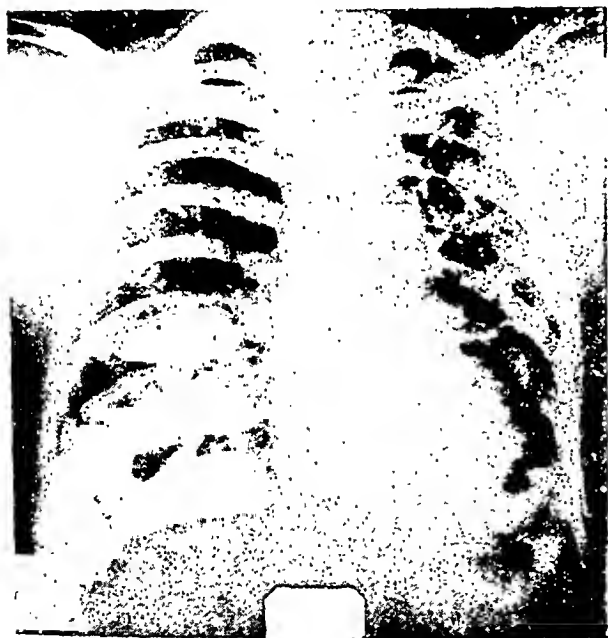
By Y. G. SHRIKHANDE, B.Sc., M.A., B.S., T.D.B. (Wales)  
Medical Superintendent, King Edward VII Sanatorium,  
Bhowali, U. P.

I HAVE lately come across several cases in the sanatorium or under my private care who were not suffering from any active tuberculous disease but were the victims of non-tuberculous affections of the lungs. I believe the same must be the experience of other sanatorium doctors. I mention the following cases to show that if ordinary precautions were taken in the diagnosis of pulmonary conditions, mistakes would be reduced and patients suffering from non-tuberculous conditions would not occupy the sanatorium beds that are primarily intended for tuberculous patients. The importance of this precaution will be obvious in a country like India where

cough and every rise of temperature to tuberculosis and pack the patient off to a sanatorium for treatment.

Case 1.—S. N. D., male, 21 years, came to me for consultation with a history of chronic cough of several years' duration. About two months back he spat blood in small quantities on two occasions. The temperature was normal except during the period of hæmoptysis when it rose to 101°F. Appetite was good and there was no loss of weight. Gave history of profuse expectoration for a few days after which it stopped. The sputum was not foul-smelling, at any rate the patient did not notice it. Suffered from pneumonia in childhood. Was diagnosed as a case of pulmonary tuberculosis at his native place and sent to the hills for treatment. Report of x-ray taken 'extensive fibrotic condition of the left lung with adhesions and slight involvement of the right lung at the hilar region'.

The patient was examined by me and some tendency to clubbing of the fingers was noticed. Left side of the chest was flatter and movement was restricted on this side. Vocal fremitus and vocal resonance were diminished and the apex beat was also displaced to the left. Cog-wheel breathing was heard over the entire



Case 1.  
Figs. 1 and 2.

sanatorium accommodation is so very limited. There are very few sanatoria worth the name in this vast country of ours, and the accommodation does not reach to four figures for a population of several crores. It is earnestly hoped that in future serious attention will be paid to the health of the country and more hospitals and sanatoria will be built for the treatment of this disease which has been rightly described as the 'Captain of the Men of Death'. Whilst there can be no doubt that tuberculosis is on the increase in this country on account of the poverty and ignorance of the people as also on account of the industrialization that is taking place, there appears to be a tendency on the part of general practitioners to attribute every onset of

left lung but no adventitious sounds were heard. Sputum was found negative for tubercle bacilli.

The skiagram brought by the patient did not show any evidence of infiltration in the lung fields but there was a marked honeycombed appearance in the left lung field with fluid levels in the rounded shadows (figure 1). It is remarkable that this striking appearance was missed by the radiologist who took the skiagram.

Taking all the evidence of the case into consideration I thought the case was wrongly diagnosed as tuberculosis of the lungs and was, in all probability, one of bronchiectasis.

I therefore took another skiagram after injecting lipiodol through the crico-thyroid membrane. On account of extreme nervousness on

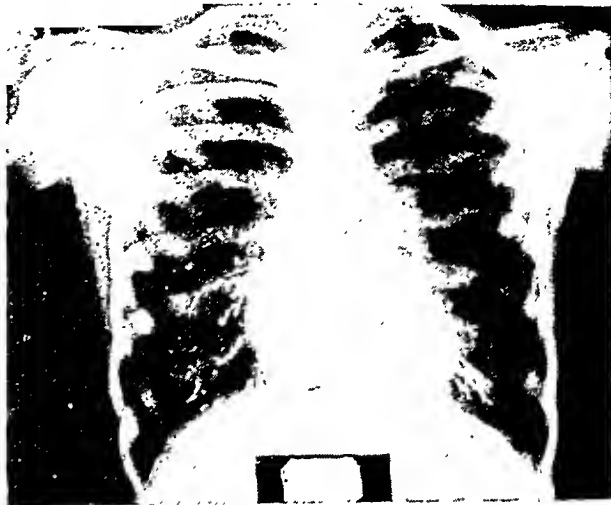
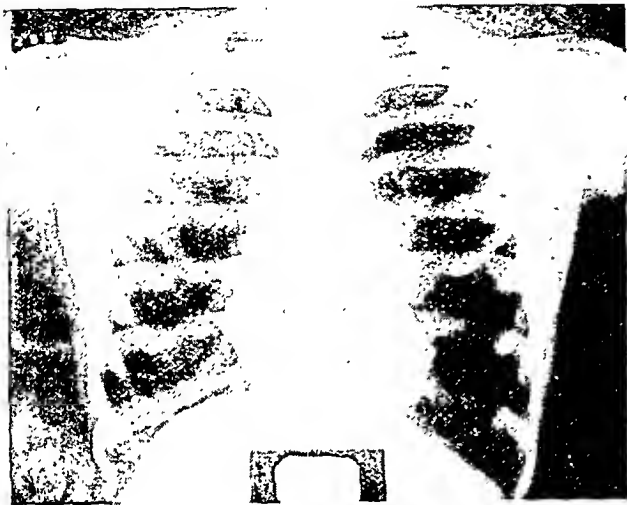
the part of the patient, lipiodol could not be introduced in sufficient quantity, but what little reached the left side of the chest was enough to confirm the diagnosis of bronchiectasis (figure 2).

Case 2.—D. S., male, 22 years, was admitted into the sanatorium with a history of chronic cough and bronchitis from childhood. Treated by *vaidyas* and

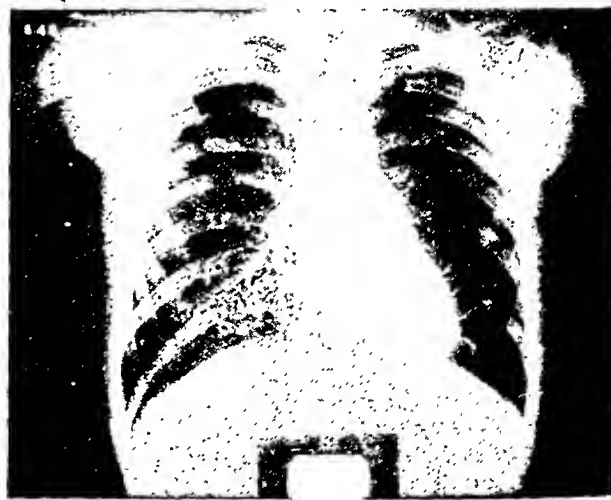
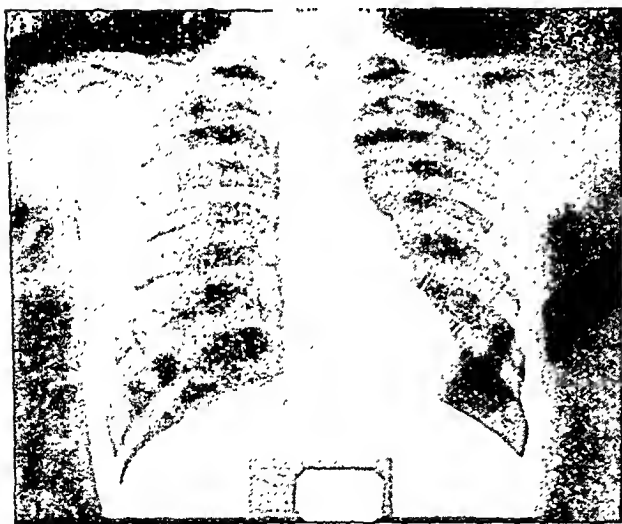
Skiagram showed no evidence of active tuberculous disease in the lung fields but the hilar shadows were very heavy and pulmonary markings were exaggerated at the bases (figure 3).

Injection of lipiodol showed bronchial dilatation in both lungs (figure 4).

Case 3.—S. L. J., male, 14 years, was admitted with a history of cough, expectoration, fever, and growing



Case 2.  
Figs. 3 and 4.



Case 3.  
Figs. 5 and 6.

*hakims* without any improvement. Cough was getting worse and causing dyspnoea and there was thick mucopurulent expectoration. Was advised by local doctors to go to a sanatorium.

On admission, the temperature ranged between 99°F. and 100°F. Cough was frequent and troublesome and expectoration was thick and greenish-yellow. Dyspnoea was present. Sputum was negative for tubercle bacilli, on repeated examinations. Differential leucocyte count was polymorphonuclears 40 per cent, lymphocytes 14 per cent, and eosinophils 46 per cent. Blood sedimentation was 10 mm. (Westergren method). Rhonchi and crepitations were present in both lungs.

weakness. Cough was troublesome and spasmodic and expectoration was thick, mucopurulent and foul-smelling. Tubercle bacilli were not found in sputum on repeated examinations. Differential leucocyte count showed polymorphonuclears 66 per cent, lymphocytes 27 per cent, large mononuclears 4 per cent, and eosinophils 3 per cent. Blood sedimentation was 7 mm. in the first hour (Westergren method). Tonsils were enlarged and clubbing of fingers was present.

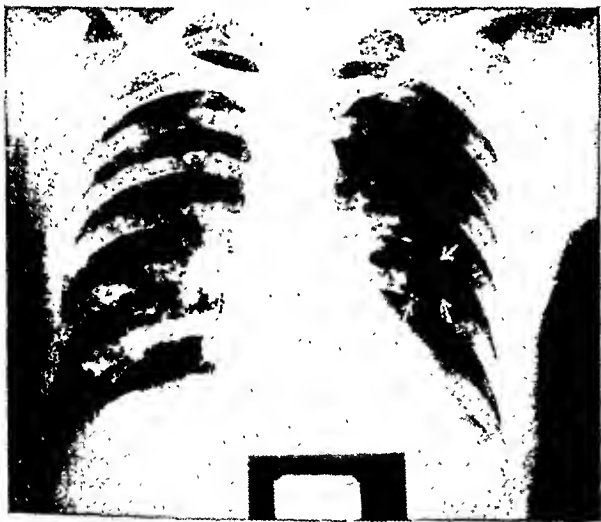
Left side of the chest was flatter and percussion note was impaired at the base. Breath sounds were bronchial, rhonchi and crepitations were present and whispering pectoriloquy was heard.

Skiagram showed no evidence of infiltration in either lung field but the heart shadow was displaced to the left and the left dome of the diaphragm was raised (figure 5). The bronchial markings at the bases were exaggerated and looked unusually broad at the left base. The right lung field showed exaggerated markings while emphysematous condition was present in the left lung field.

Skiagram taken after the intra-tracheal injection of lipiodol confirmed the bronchial dilatation on the left side where most of the oil was collected behind the heart shadow (figure 6). Possibly there was also a massive collapse of the left lower lobe due perhaps to bronchial obstruction.

Case 4.—T. L., male, 35 years, came to me for consultation with a history of chronic cough and thick greenish-yellow sputum. Gave history of pneumonia some five years back. Was told by an eminent doctor that he had tuberculosis of the lungs. The patient told me that he had his sputum examined several times but it was found negative for tubercle bacilli. Sputum was not foul-smelling. Physical examination of the chest elicited the presence of adventitious sounds at the base of the left lung. Sputum examined by me was found negative for tubercle bacilli.

I took a skiagram of the chest and it showed no tuberculous disease in the lung fields but the hilar shadows were very heavy and the bronchial markings were exaggerated at the bases. There was also some evidence of honeycombed appearance at the bases and particularly in the second and third interspaces anteriorly on the left side (figure 7).



Case 4.  
Fig. 7.

The patient looked the picture of health and I assured him that he was not suffering from tuberculosis of the lungs but that there was evidence of bronchiectasis present in the chest.

Case 5.—A boy of about 12 years was expectorating thick, purulent, and foul-smelling sputum which was negative for tubercle bacilli on repeated examinations. He was sent to the hills for the treatment of tuberculosis.

Physical examination of the chest gave me the impression that the boy was suffering not from tuberculosis but from some non-tuberculous affection of the lungs. I took a skiagram of his chest and it was very suggestive of abscess of the right lung. Artificial pneumothorax was suggested by his doctors but from the physical signs in the chest, it was not likely to be successful owing to the presence of thickened pleura and, moreover, it was, in my opinion, a dangerous suggestion which might have done more harm than good to the patient. I advised him to undergo medicinal treatment in order to encourage free drainage and also aspiration through a bronchoscope, if necessary, at the hands of an expert.

### Discussion

The above cases are a selection from several that, for want of proper investigation, were wrongly diagnosed as cases of pulmonary tuberculosis and sent to the sanatorium for the treatment of tuberculosis. The history of these cases together with the physical findings and x-ray appearances were, in my opinion, sufficient to label them as 'non-tuberculous'. The popular view that bronchiectasis is characterized by large quantities of foul-smelling sputum must be revised. Until recently only those cases were recognized in whom the condition had become distinctly apparent and the symptoms were typical. With the increasing use of x-rays in the diagnosis of chest conditions, the improvement in its technique, and also in the interpretation of the shadows, and with the injection of iodized oil to outline the bronchial tree more clearly, much light has been thrown on the early and latent stages of bronchiectasis. As the oil casts dense shadows on the film, the injected bronchial tree stands out prominently and the dilatations are revealed in many cases in which the physical examination of the chest failed to reveal them. In case 1 particularly, the x-ray appearances, even without lipiodol, were characteristic enough to make a diagnosis of bronchiectasis.

The presence of hæmoptysis perhaps misleads the doctor as in case 1. It must not be forgotten, however, that while pulmonary tuberculosis is the most common cause of hæmoptysis, it is not the only one and that bronchiectasis ranks only second to pulmonary tuberculosis in causing it.

Another mistake that commonly leads to a wrong diagnosis is the failure to examine the sputum. The majority of mistakes are due to the neglect of this simple procedure. All the cases mentioned above were negative for tubercle bacilli on repeated examinations. The absence of tubercle bacilli in definitely purulent sputum, on repeated examination, as pointed out by Burrell, is a very strong evidence against tuberculosis. When doubt still exists, guinea-pigs may be inoculated.

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## A NOTE ON A CASE OF *BRUCELLA ABORTUS* INFECTION IN ADEN

By E. S. PHIPSON, C.I.E., D.S.O., M.D., M.R.C.P., D.P.H.

LIEUTENANT-COLONEL, I.M.S.

Senior Medical Officer, Colony of Aden

THE occurrence of *Brucella abortus* infection in human beings has been studied for several years in various parts of the world. According to W. Dalrymple-Champneys (1933) the modern history of this disease dates from after the Great War. Thus, in the year 1922, one case was reported in the United States of America, the number increasing to 1,545 in 1933: the disease appeared in epidemic form in Greece, in 1927 (Livierato, 1932); it first appeared in Scotland in 1930 (Beattie, Smith and Tulloch, 1935) and many cases have been reported all over the British Isles and in other countries, at intervals during the past few years. There is evidence that the infection, though often latent, is widespread in its distribution and routine Widal examinations of sera from unclassified febrile cases in England show agglutination of *Br. abortus* to a significant titre in about 4 per cent of cases (Messer, 1934).

The infection among bovines would seem in the British Isles to be even more widespread; thus Walker Hall (1933) reported the presence in milk of agglutinins to *Br. abortus*, in the Bristol district, as follows: (1) Raw churn milk, positive in 26 per cent, (2) pasteurized milk, 31 per cent, (3) graded milk, 44 per cent. The apparent anomaly of the rising percentage of positive findings in this series is probably due to the fact that while raw churn milk-samples are likely to come from a few cows only, the pasteurized and graded milk-samples are probably from the pooled output of many cows. A similar relationship appears in the findings of Messer (1934) who recorded that 73 out of 401 samples of milk were found to contain living *Br. abortus* and that there was a definite relationship between the size of the herd and the frequency with which the milk was infected; with 1 to 9 cows in a herd, 10.2 per cent were infected; with 10 to 19 cows, 19.6 per cent; with 20 to 29 cows, 36.7 per cent; and with over 30 cows, 40.0 per cent. With such formidable risks of bacterial infection the low incidence of active clinical infection in human beings is surprising, and it suggests a pronounced degree of insusceptibility in the human race. The annual number of cases in England and Wales has been computed at about 300 (Wade, 1933).

**Source of infection.**—Most observers seem to be agreed that actual contact with infected bovines or their flesh is not the usual source of infection; thus Dalrymple-Champneys (1933) reported that, in 115 cases in England, there was no instance of a veterinary surgeon, a butcher or a slaughterman being attacked, while in a review of 97 cases in Scotland, Beattie, Smith and Tulloch (1935) found that in only 14 could

any history of contact be established. It is therefore probable that raw milk is the common source of infection in the human being, chilled (but not pasteurized) milk being especially liable to contain the organism. Pasteurized milk has been shown to be free from living *Brucellæ* though, as stated above, it may and often does contain the reactive agglutinins.

**Clinical types of the disease.**—In the Scottish series referred to above the commonest symptoms were fever, fatigue, nocturnal sweating, headache, afternoon rigors and pains in the muscles and joints. In other and more severe cases the symptoms suggest acute surgical conditions such as acute appendicitis and cholecystitis. One such case is recorded in which laparotomy was performed for gallstones, but no stones were found. Simpson (1932) of Ohio states that the organism has a predilection for the genital tract and has a relationship to certain cases of tubo-ovarian abscess, seminal vesiculitis, prostatitis, epididymitis and orchitis and that joint manifestations are common. I have not been able to find any record of the occurrence of the disease in a pregnant woman, but in such a case abortion would presumably result, as in bovines.

**An illustrative case.**—I was called to see Mr. S. C. B., a Scottish engineer, aged 42, who was suffering from fever, believed to be due to prolonged exposure to the sun in the course of his work, which for several weeks had been more than usually exacting. The onset of fever was insidious. The patient suffered for six days with increasing lassitude, muscular weakness, and excessive sweating. On the seventh day he had to lie up, and his temperature was found to be 104°F. His temperature chart, which is appended, was started from this point. On examination, beyond some flushing of the skin of the head and neck and some suffusion of the conjunctivæ, there was nothing to note in his appearance, and the physical examination was practically negative. His chief complaint was intense headache behind the eyes, increased by any movement of the eyes in their orbits. After excluding malaria as a possible cause I came to the conclusion that the case was one of atypical dengue fever, as the eye pains seemed almost characteristic. I treated him on the usual symptomatic lines, controlling the headache as far as possible with aspirin and caffeine citrate, and awaited the defervescence which, in the local variety of dengue, generally takes place on the 6th or 7th day. The patient however continued febrile, and on the 18th day of the disease I took a sample of blood for Widal reaction against organisms of the typhoid group and organisms, such as *Br. melitensis*, which, in Aden, are used as a routine test at the same time.

The examination was carried out by my colleague, Squadron-Leader P. B. Lee-Potter, Officer in charge, R. A. F. Laboratory, Aden, with the following result:—

Agglutination against:

(1)	<i>Bact. typhosum</i> 'H'	..	1/50
(2)	" " 'O'	..	nil
(3)	" <i>paratyphosum</i> A 'H'	..	"
(4)	" " A 'O'	..	"
(5)	" " B 'H'	..	"
(6)	" " B 'O'	..	"
(7)	<i>Brucella abortus</i> (Bang)	..	1/5,000
(8)	" <i>melitensis</i>	..	1/25 (Zonagc)

These findings established the diagnosis of *Br. abortus* infection, and relieved my mind of any apprehension as to prognosis. The fever and its concomitant symptoms reached their height on about the 12th day and

NAME, MR. S.C.B.

AGE 42

DISEASE BR. ABORTUS INFECTION

RESULT CURED

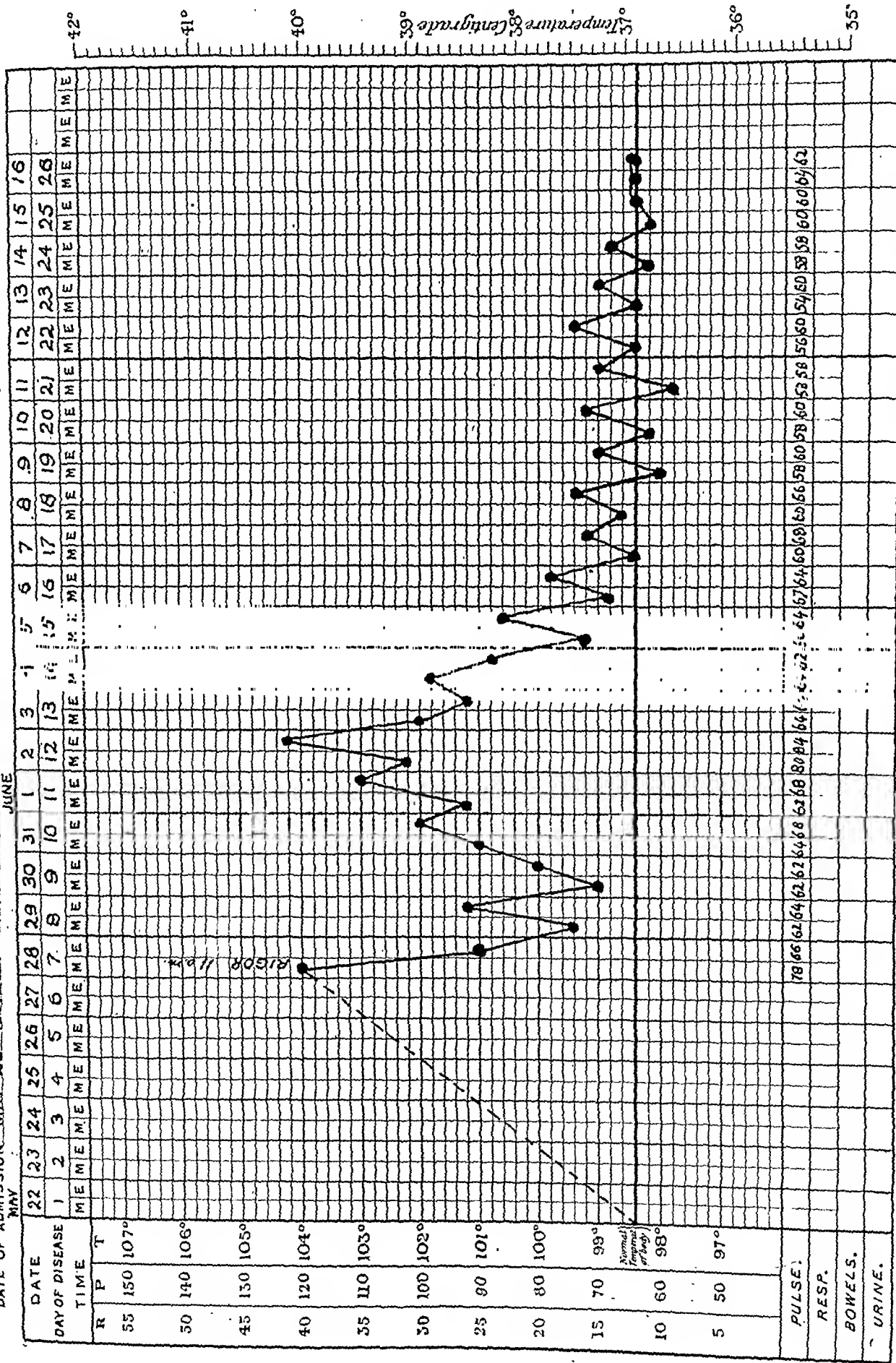
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## STUDY OF COMMERCIAL BACTERIOPHAGES

## I. BACTERIOPHAGES ACTIVE AGAINST THE DYSENTERY GROUP OF ORGANISMS

By C. L. PASRICHA

MAJOR, I.M.S.

M. N. LAHIRI

S. K. GUPTA

and

D. N. CHATTERJEE

(From the Bacteriological Department, School of Tropical Medicine, Calcutta)

BACTERIOPHAGE is widely used in the treatment of many bacterial infections, particularly of certain intestinal disorders. Not only does the medical practitioner prescribe it frequently for his patients but many individuals take a course of bacteriophage without medical advice. Although it is impossible to obtain any reliable information as regards the actual amount of bacteriophage used in a city such as Calcutta, from certain information that we have been able to gather, it appears that approximately a million ampoules of bacteriophage are consumed annually in Calcutta. The number of firms who market preparations of bacteriophage is increasing, and bacteriophage is obtainable at many of the retail chemists in Calcutta. Although the use of bacteriophage both in the prevention and cure of certain diseases is extensive there is no information available as to the virulence or potency of preparations of commercial bacteriophage. The physician is not in a position to know whether he is using a preparation containing powerful bacteriophages or merely a tube of inert broth. d'Herelle and his most enthusiastic supporters have repeatedly stressed the point, that for bacteriophage therapy to be of any real value the bacteriophage used must be of the maximal activity for the infecting bacteria. Little or no benefit is to be expected when the bacteriophage administered is not of sufficient

potency or does not lyse the strains causing the infection. Straub and Applebaum (1933) examined certain bacteriophages prepared and marketed by three American firms. The bacteriophages were claimed to be active against staphylococci, streptococci and coliform bacilli. These authors found that the products of one firm contained a preservative and no demonstrable bacteriophage. The products of the other two companies although containing no preservative were poor in their potency.

The present report is based on a study of thirty-five preparations of commercial bacteriophages. Thirty-one of these were of dysentery bacteriophage or bacteriophages claimed to be active against dysentery and certain other intestinal bacilli. Three preparations, said to contain bacteriophages active against the enteric group of bacilli, are included for the sake of comparison. Bacteriophages were obtained from retail shops situated in different parts of Calcutta and represent the products of six manufacturers. No sample of bacteriophage was obtained direct from any of the firms. The preparations examined can be regarded as fairly representative of the bacteriophages used in actual medical practice.

Each preparation of bacteriophage was tested for its reaction, range of virulence, the degree of lysis in fluid medium, and the titre of the bacteriophage, as judged by the number of 'corpuscles' active for certain bacteria. The toxicity of the various preparations was tested by injecting 0.5 c.cm. of the preparation intraperitoneally into mice and all the preparations were found to be non-toxic. The presence of any contaminating bacteria was tested for by adding 0.4 c.cm. of each preparation to 30 c.cm. of nutrient broth and incubating one series aerobically and another series under anaerobic conditions for seven days. No contaminating organisms were found in any of the preparations. An ampoule from each batch was inoculated with a culture of staphylococci. There was no inhibition of growth, each tube gave a growth as heavy as a control tube of broth. This was taken to indicate the absence of any preservative, in concentrations sufficient to retard the growth of staphylococci.

The range of virulence was tested on solid medium (pepsin-digest-nutrient agar). Smears were made from young (4 to 6 hours old) actively-growing peptone-water cultures of the test bacteria, allowed to dry and when dry drops of bacteriophage were placed on marked areas. The use of two small loops carried in one loop-holder was found convenient for drops of bacteriophage could be placed at one operation on two marked areas instead of on only one area as in the usual method. The plates were incubated and the results recorded the next day. The following 36 strains of bacteria were used to test the virulence and potency of the commercial bacteriophages. These strains were lysable by the laboratory phages.

(Continued from previous page)

India, of human infection by *Br. abortus*. The routine investigation of sera from cases of unclassified fevers in India by a Widal test against *Br. abortus* might sometimes assist in classifying those atypical fevers which, all too often, defy a precise diagnosis and tend to acquire that classical but unsatisfactory label 'Pyrexia of Uncertain Origin'.

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(1) *Bact. flexneri*—twelve strains comprising the standard strains V, W, X, Y, and Z, and seven recently-isolated strains.

(2) *Bact. shigæ*—three strains, one of which was an old laboratory strain and two recent strains.

(3) *Bact. schmitz*—one standard strain obtained from the Lister Institute and one isolated in the laboratory in 1935.

(4) *Bact. sonne*—one smooth laboratory strain (date of isolation unknown).

(5) Single strains of Newcastle and '88' (Boyd's sub-group B), *pseudo-carolinus*, *morgani* and *dispar*.

(6) Single strains of *Bact. typhosum*, *paratyphosum A, B, and C* (local strains), *enteritidis*, *ætrycke*, *Staphylococcus aureus* and *albus*, *Ps. pyocyanea*, proteus and a streptococcus isolated from a stool.

(7) Two strains of *V. cholera*, one a freshly-isolated agglutinable vibrio and the other a standard cholera strain (Inaba).

*Ps. pyocyanea*, proteus and the streptococcus were not lysed by any of the bacteriophages tested. *Staph. aureus* was lysed by three preparations (nos. 4, 8 and 34) and *Staph. albus* by only one sample (no. 18). These results have not been included in the tables.

The lysis in fluid medium was tested by adding a measured quantity of the bacteriophage to a tube of papain-digest-meat broth containing young actively growing bacteria. Eleven strains (*flexneri* 3, *shigæ* 2, and one each of *schmitz*, *sonne*, *newcastle*, *pseudo-carolinus*, *typhosum* and *cholera*) were selected for this test. The degree of lysis was noted at intervals and the tubes kept under observation for six days. Adequate controls were maintained throughout these experiments.

The enumeration of bacteriophage corpuscles contained in the different preparations was made by spreading known volumes of bacteriophage-bacterium mixtures on pepsin-digest-agar plates.

TABLE I

The preparations of commercial bacteriophages tested, the potency claimed by the manufacturers, and the time of examination in relation with the time of expiry

Serial number	Number of months claimed potent at the time of test	Number of months after date of expiry	POTENCY CLAIMED FOR			
			Dysentery bacilli	Cholera vibrio	Enteric group	Miscellaneous intestinal bacteria
1	6	..	+	—	—	—
2	9	..	+	—	—	—
3	16	..	+	—	—	—
4	16	..	+	—	—	—
5	Not given	..	+	—	—	—
6	ditto	..	+	—	—	—
7	..	2	+	—	—	—
8	..	28	+	—	—	—
9	2	..	+	—	+	+
10	6	..	+	+	+	+
11	9	..	+	—	—	+
12	12	..	+	—	+	+
13	12	..	+	—	+	+
14	12	..	+	—	+	+
15	16	..	+	+	+	+
16	16	..	+	+	+	+
17	19	..	+	+	+	..
18	19	..	+	+	+	+
19	22	..	+	+	+	+
20	22	..	+	—	+	+
21	24	..	+	+	+	+
22	28	..	+	—	+	+
23	Not given	..	+	—	+	+
24	ditto	..	+	—	+	+
25	ditto	..	+	—	+	+
26	ditto	..	+	—	+	+
27	..	2	+	+	+	—
28	..	5	+	—	+	+
29	..	15	+	—	—	+
30	..	15	+	+	—	—
31	..	45	+	—	+	+
32	15	..	—	—	+	—
33	21	..	—	—	+	—
34	..	2	—	—	+	—
35	..	15	—	—	+	—

The dilutions were made with standard calibrated loops.

In table I are enumerated the bacteriophages examined, the bacteria for which the manufacturers claimed potency for their products, and the time in months from the date of the examination for which full potency was claimed. Eight of the samples had been kept in the laboratory and were examined after the date of expiry. In four samples no date of expiry was given either on the box or in the enclosed literature.

The range of activity and the degree of lysis are indicated by numbers, 4 represents wide range of activity or complete lysis, 3 represents moderate range of activity or incomplete lysis, 2 represents restricted activity or poor lysis and 1 represents very limited activity and feeble lytic power. The number of corpuscles of bacteriophage is given in millions per c.cm. The first eight preparations were claimed to be potent for the dysentery group of bacilli. In five the potency was specified for flexneri

TABLE II  
The range of virulence of the different preparations of commercial bacteriophages. The number of strains of each variety of bacteria used in the test is indicated in brackets

Serial number	Shigæ (3)	Schmitz (2)	Flexneri (12)	Newcastle (2)	Sonne (1)	Unclassified (5)	Cholera (2)	Typhosum (1)	Para A, B and C (3)	Gaertner (1)	Aertrycke (1)
1	3	4	3	0	2	0	4	2	1	1	0
2	3	4	4	1	4	0	4	0	1	2	0
3	1	0	1	0	0	0	0	0	0	0	0
4	3	1	3	0	4	0	4	3	3	0	2
5	4	2	3	1	1	0	0	1	4	1	2
6	4	4	4	4	4	3	0	2	1	4	2
7	0	0	0	0	0	0	0	0	0	2	0
8	1	0	1	0	0	0	1	0	0	0	0
9	3	2	4	2	1	0	0	3	1	0	0
10	0	0	0	0	0	0	0	0	0	0	0
11	3	1	3	0	3	0	0	0	0	1	0
12	4	4	3	1	3	0	0	0	3	3	1
13	4	1	3	1	3	0	0	0	1	1	0
14	3	3	3	0	3	0	0	0	3	3	0
15	3	0	3	0	3	0	0	0	3	3	1
16	3	1	3	0	3	0	0	0	3	3	1
17	3	1	3	0	3	0	0	0	3	3	1
18	3	1	3	0	3	0	0	0	3	3	1
19	3	1	3	0	3	0	0	0	3	3	1
20	3	1	3	0	3	0	0	0	3	3	1
21	4	4	4	3	4	1	0	0	4	3	0
22	3	1	3	0	3	0	0	0	3	3	0
23	3	1	3	0	3	0	0	0	3	3	0
24	4	4	4	3	4	0	0	0	4	3	0
25	4	4	4	3	4	0	0	0	4	3	0
26	4	4	4	3	4	0	0	0	4	3	0
27	4	4	4	3	4	0	0	0	4	3	0
28	0	0	0	1	0	0	0	0	0	0	0
29	3	0	3	0	3	0	0	0	3	0	0
30	0	0	0	0	0	0	0	0	0	0	0
31	1	0	1	0	1	0	0	0	1	0	0
32	3	3	1	3	0	1	3	4	0	0	0
33	0	1	0	1	0	0	1	0	0	0	0
34	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0

Table II gives the range of virulence of the different preparations of bacteriophage and in table III is recorded the degree of lysis produced. In table IV is given the pH values of the different samples and the number of bacteriophage corpuscles active against each of the specified bacteria. Although the results of the various tests were recorded in detail, only the important and essential data have been included in the accompanying tables.

and shigæ. The tabulated results show that the actual range of virulence is more extensive than that claimed by the manufacturers. Some of the preparations act on cholera vibrio and on certain bacilli of the enteric group. In liquid medium the majority of these bacteriophages produce lysis of shigæ, flexneri, sonne and schmitz in the order named, with decreasing intensity. Two samples produced moderate degrees of lysis of typhosum but there was no

visible lysis of cholera vibrio produced by any of these preparations. Two of these bacteriophages (nos. 7 and 8) were time-expired when examined. Sample no. 7 contained no demonstrable bacteriophage two months after the date of expiry, whereas bacteriophage no. 8 examined 28 months after the date of expiry still possessed bacteriophages active against shigæ, flexneri and cholerae. Preparation no. 3 which was examined sixteen months before the date of expiry was found to contain only very feeble bacteriophages

of activity is wide, the degree of lysis produced is comparatively poor. The enumeration of the bacteriophage corpuscles shows that many of the preparations are of low titre.

It is interesting to note that of the bacteriophages examined after the date of expiry two preparations, nos. 30 and 31, examined 15 and 45 months respectively after the date of expiry still showed the presence of bacteriophages. Bacteriophage no. 10 examined six months before the date of expiry contained no demonstrable

TABLE III

*The degree of lysis produced by the different preparations of bacteriophage on specified bacteria. The number of strains on which the lysis was tested is indicated in brackets*

Serial number	Shigæ (2)	Schmitz (1)	Flexneri (3)	Newcastle (1)	Sonne (1)	Unclassified (2)	Cholerae (1)	Typhosum (1)
1	3	2	2	0	1	0	0	0
2	0	2	2	0	3	0	0	0
3	0	0	1	0	0	0	0	0
4	4	0	4	0	3	0	0	2
5	4	2	3	0	1	1	0	2
6	3	2	3	3	4	2	0	0
7	0	0	0	0	0	0	0	0
8	0	0	1	0	0	0	0	0
9	2	0	2	0	1	0	0	0
10	0	0	0	0	0	0	0	0
11	2	1	2	0	2	0	0	3
12	4	2	3	0	3	0	2	0
13	2	0	2	0	2	0	0	0
14	2	0	2	0	1	0	0	0
15	2	1	1	0	3	0	0	1
16	2	0	2	0	3	0	2	2
17	2	0	2	0	3	0	0	0
18	3	1	2	0	4	0	0	4
19	2	1	2	0	3	0	0	1
20	3	1	2	1	2	0	0	2
21	3	0	2	0	3	0	0	0
22	4	0	2	0	2	0	0	0
23	2	3	3	0	2	0	0	3
24	2	1	2	0	4	0	0	2
25	3	4	4	2	3	0	0	0
26	3	3	2	0	3	0	0	3
27	0	0	0	0	0	0	0	0
28	4	0	2	0	1	0	0	0
29	0	0	0	0	0	0	0	0
30	1	0	1	0	0	0	0	0
31	1	0	1	0	0	0	0	0
32	0	0	1	0	1	0	0	1
33	0	0	1	0	0	0	0	0
34	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0

for shigæ and flexneri. This preparation is as poor in its potency as no. 8.

Preparations nos. 9 to 31 were claimed by the manufacturers to contain bacteriophages active against dysentery bacilli and also against certain other intestinal bacteria. A long list of somewhat heterogeneous bacteria is enumerated in the literature issued by the makers. Preparations nos. 32 to 35 were claimed to be active against the enteric bacilli.

The results of the examination show that whereas in a majority of the samples the range

bacteriophage and no. 33 examined 21 months before the date of expiry contained feeble flexner and typhoidphages which could not be enhanced to any marked extent, even after repeated attempts, in the laboratory.

The names of the manufacturers have not been included in this report. The preparations of the different firms were given serial numbers so that it was not possible to identify the products of any company whilst the various tests were in progress. An analysis was made after the whole experiment was completed. The

bacteriophages prepared by five of the six companies possess a wide range of virulence and produced visible lysis of a large percentage of bacterial strains and were of fairly high titre, as shown by the enumeration of the bacteriophage corpuscles. Although the products of three firms appeared to give the best results, no significant difference in potency, as measured by plaque counts and lytic action in fluid medium, was apparent. The bacteriophages of the sixth company were on the whole bad. Eight preparations marketed by this company were examined. Three of these, although examined well before the date of expiry, contained no demonstrable bacteriophage or poor bacteriophages. Three

Of the 26 products examined before the date of expiry, from the results of the laboratory tests, only six can be considered as of maximal potency and suitable for clinical use. Four products are of moderate potency, eleven of comparatively poor potency and five are definitely bad in that they either contain very feeble or no bacteriophages.

### Conclusions

The results suggest that a number of commercial preparations of bacteriophage contains extremely weak bacteriophages and are not of sufficient potency to give the same clinical

TABLE IV

*The pH values of the different preparations of bacteriophage and the number of corpuscles of bacteriophage active against specified bacilli contained in 1 c.cm.*

Serial number	pH	BACTERIOPHAGE CORPUSCLES IN MILLIONS PER C.C.M.					
		Shigæ	Schmitz	Flexneri	Sonne	Cholera	Typhosum
1	8.1	8	0.8	9	0.05	6	0
2	7.9	7	8	10	8	2	0.1
3	7.0	0.05	0	0.07	0	0	0
4	8.4	8	0	8	7	4	1.5
5	7.3	8	0.3	8	2	0	6
6	7.9	9	8	11	7	0	5
7	7.0	0	0	0	0	0	0
8	7.3	3	0	0.05	0	0	0
9	7.7	8	0.3	9	0.04	0	0.8
10	7.8	0	0	0	0	0	0
11	8.1	9	1.4	7	8	1.5	7
12	7.3	9	4	9	8	0	6
13	7.2	8	0.2	7	9	0	5
14	7.2	0.08	0.8	0.1	0.07	0	0.3
15	8.1	0.5	0	9	8	1	0.4
16	8.3	10	0.01	8	9	1	8
17	7.2	0.4	0	0.4	8	0.1	7
18	7.1	10	1.4	7	10	0	8
19	7.1	9	0.1	7	8	0	8
20	7.3	7	0.4	9	9	0	9
21	8.2	7	0.04	7	8	2	9
22	7.3	6	0	9	0.03	0	0.08
23	7.2	8	0.4	9	7	0	7
24	7.0	7	0.2	9	9	0	6
25	7.6	8	0.05	10	7	8	0
26	7.2	8	0.02	9	1.4	0	2
27	7.0	0	0	0	0	0	0
28	7.5	8	0.6	7	0.2	0	0.3
29	8.4	0	0	0	0	0	0
30	8.4	5	0	6	0	0	0
31	8.4	0	0	0	0	0	0
32	8.1	7	0.003	8	6	0	7
33	7.0	0	0	0.003	0	0	0
34	7.0	0	0	0	0	0	0
35	8.4	0	0	0	0	0	0

preparations of this firm examined within two months of the date of expiry possessed either no lytic properties for any of the bacteria used in the tests or contained feeble bacteriophages whose potency could not be enhanced in the laboratory. The other two preparations contained bacteriophages of moderate to poor potency. This could only be the result of faulty methods of preparation:

results as might be expected from potent bacteriophages. There is a real necessity for the testing and examination for potency of the bacteriophage used for clinical purposes.

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# TYPES OF TYPHOIDPHAGE AND A NOTE ON THE PROTECTIVE VALUE OF TYPHOIDPHAGE IN ANIMAL EXPERIMENTS

By C. L. PASRICHA

MAJOR, I.M.S.

M. N. LAHIRI

and

D. N. CHATTERJEE

(From the Bacteriological Department, School of Tropical Medicine, Calcutta)

PASRICHA, deMonte and Gupta (1931) reported the isolation of four types of typhoidphage but the properties of the different types were not then described. These four types not only form plaques or clearings which differ in their morphology but give the 'reciprocal cross tests'. A secondary culture (produced after the action of any one of the types on a susceptible strain of *Bact. typhosum*) is lysable by the other three types. The general characteristics of these four types are :—

Type 1 is a quick-acting bacteriophage producing large 'clearings' about 3 to 4 mm. in diameter without any outer lytic zones. The area of the bacteriophage zone is covered with a thin layer of secondary growth. In liquid medium this type produces complete lysis in less than one and a half hours but the lysis is not permanent and is followed by an abundant secondary growth in four to five hours. The generation time is approximately between 45 minutes to one hour. This type attacks only on smooth freshly-isolated strains of typhosum and does not lyse any of the salmonellae. The number of corpuscles usually reached is  $n \times 10^9$  per c.cm.

Type 2 is also a quick-acting bacteriophage producing complete lysis in four hours. The lysis is not maintained for very long and in 9 to 10 hours an abundant secondary growth appears. The generation time of this type is between  $1\frac{1}{2}$  to two hours and the concentration reached is between  $n \times 10^7$  and  $n \times 10^8$  per c.cm. The clearings produced are 1 to 2 mm. in diameter, clear-cut without any outer zones and without any secondary colonies in the bacteriophage zone. The range of virulence of this type is wide. It acts on both the smooth and rough strains of typhosum as well as on many of the salmonellae.

Type 3 is a slow-acting bacteriophage. In liquid medium only a slight degree of lysis is produced after incubation for 11 hours but this lysis is maintained for over 48 hours. There appears to be considerable destruction of the bacilli without any marked bacteriolysis. On solid medium this type gives minute clearings about 0.5 mm. in diameter with a faint trace of an outer zone round each clearing. There are no secondary colonies in the bacteriophage zone. The number of corpuscles is usually  $n \times 10^9$  per c.cm. Its range of virulence is wide, it

lysed all the strains of typhosum tested and many of the salmonellae.

Type 4 is also a slow-acting bacteriophage producing a very slight degree of lysis. It produces clearings which are about 1 mm. in diameter and have an undermined edge with no secondary colonies. Its range of virulence is wide somewhat like that of type 3, and the corpuscles produced are about  $n \times 10^8$  per c.cm.

We have already mentioned that typhoidphage type 1 possesses restricted range of virulence. It acts on certain strains of *Bact. typhosum* whereas the other three types act on all the 19 strains of typhosum used in the test. Type 1 lyses the three strains of typhosum (Ty 2, Watson and Kasauli Vi) known to contain 'Vi' antigen and 13 out of the 16 recently-isolated strains. It does not act on the standard strains H 901 and O 901 known to be devoid of the Vi antigen. It appears, therefore, that type 1 is similar to the 'V bacteriophage' described by Craigie and Brandon (1936). This bacteriophage was isolated from certain cultures of typhosum derived from the stools of cases and carriers, and acted only on the V form of *Bact. typhosum*. These authors showed that the sensitivity to V bacteriophage and capacity to absorb it are intimately related to the presence of V agglutinin and that the W forms of typhosum which do not possess this antigen are resistant to this bacteriophage. After the action of this bacteriophage on V form of typhosum the secondary cultures which develop are of the phage-resistant W form with loss of V agglutinin. This observation is of considerable practical value not only in the identification of V forms but also in the study of the W degradation form. The V form of the typhoid bacillus has the Vi antigen fully developed and is O inagglutinable. The W form has no Vi antigen and is well agglutinable by an O serum and in between these two forms there is a variety of intermediary V W forms.

During the course of this study it was noted that typhoidphage type 2 was the only type which lysed three strains of *Bact. suispestifer* in our collection. How this is related to the antigenic structure of these strains still remains to be investigated.

## The protective value of typhoidphages

Greenwood, Hill, Topley and Wilson (1936) showed that in experimentally produced epidemics in animals bacteriophage is without any effect and that the claims put forward by d'Herelle and others for bacteriophage in the rôle of infections could not be substantiated. Experiments which were developed during the course of the study of the different types of typhoidphage, and which showed a definite protective value of typhoidphage, are recorded. At the very outset we would state that these experiments do not represent conditions as they occur



in natural infections but are recorded because they illustrate that under given conditions bacteriophage is of protective value and further that bacteriophagy can occur *in vivo*.

A strain of freshly-isolated *Bact. typhosum* ('Silloo' strain) isolated from the blood of a patient on the seventh day of the disease was used for the study of the different typhoidphage types. The M. L. D. of this strain for white mice was found to be 0.2 c.c.m. of an 18-hour-old broth culture when injected intraperitoneally. Series of five animals were given 0.5 c.c.m. of mixed typhoidphage one hour before and at different periods after the injection of typhoid bacilli ( $1\frac{1}{2}$  M. L. D.). All the injections were given intraperitoneally. The results are given in tabular form.

There is complete protection when the bacteriophage is injected one hour before or one hour after the injection of  $1\frac{1}{2}$  M. L. D. of *Bact. typhosum*. When the bacteriophage is injected later the protection is poor. These experiments were repeated with similar results. When separate types of typhoidphage were used individually no protective value was demonstrated for the different types. Two preparations of commercial typhoid bacteriophage were used in similar experiments but possessed no protective value.

#### Summary

The characters of four types of typhoidphage are described. Type 1 appears to be similar to Craigie and Brandon's V bacteriophage.

Experiments demonstrating the protective value of typhoidphage when injected intraperitoneally into mice are reported.

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#### RACES OF *A. STEPHENSI* LISTON, 1901\*

By W. C. SWEET

and

B. A. RAO

Since the finding in Europe of varieties of *A. maculipennis* (Hackett and Missiroli, 1935, and Hackett, 1937a), interest in the possibilities for similar findings in other parts of the world has been widespread, and increasing numbers of articles carry references to such possibilities. During a study of village malaria in Mysore State (Sweet, 1937), several anophelines were studied, including *A. stephensi*, from various parts of the State, but no evidence of races of Indian anophelines based on egg patterns could be found and it was concluded that other methods to distinguish possible differences would have to be used. Such a new approach to the subject was suggested by Walsh and Walsh-Sorgdrager (1935 and 1936), who found considerable differences in the measurements of ova of the Indian and Malayan forms of *A. subpictus*. [We are indebted to Strickland and Roy (1936) for the reference.]

Several references have been made at various times to the possibility of the existence of two races of *A. stephensi*, amongst which may be mentioned Knowles and Basu (1934), Ramsay and Macdonald (1936), and Mulligan and Baily (1936). Our own experience in Mysore seemed to indicate two races and for over a year we have been making measurements of ova of this species obtained from various parts of India. Since the results of these measurements seem to point to the existence of two races of *A. stephensi*, this preliminary report seems justified, although much more work remains to be done before definite conclusions can be drawn.

#### Measurements of *A. stephensi* ova

Stephens and Christophers (1902), who gave the measurements of ova of *A. metaboles* Theobald as 0.51 mm. in length and 0.19 mm. in greatest breadth including floats, stated that the float ridges numbered 15, and that the floats occupied the middle half of the ova or slightly less. They

\*The work here reported was done with the support and under the auspices of the Department of Health, Government of Mysore, and the International Health Division of the Rockefeller Foundation.

Controls 1 M.L.D. of <i>Bact. typhosum</i>		TIME OF ADMINISTERING TYPHOIDPHAGE IN RELATION WITH THE INJECTION OF $1\frac{1}{2}$ M.L.D. of <i>Bact. typhosum</i>							
		1 hour before		1 hour after		2 hours after		3 hours after	
		Alive	Dead	Alive	Dead	Alive	Dead	Alive	Dead
0	5	5	0	5	0	4	1	2	3

apparently got their specimens from either Lahore or Nagpur, or both, since they mention that larvæ were found in pots and tins in Lahore and 'in cattle hoof-marks and other similar small pools by the side of the nullah' in Nagpur. These measurements are repeated by Christophers and Barraud (1931) for *A. stephensi* ova, as the species is now named.

The ova which we measured were laid by gravid wild females confined in lamp chimneys over wet filter paper, the measurements being made by direct light under the low power of the microscope while the eggs were on the thoroughly wet paper. Tables I and II give the average measurements of two types of ova of *A. stephensi* obtained from various places. The measurements recorded were the length, the breadth at greatest point including the floats, the length of the floats, the number of ridges on one side of the float, and the proportion of the total length covered by the floats.

The *A. stephensi* of 'B' type from Mysore State came from Bangalore and Mysore cities

small numbers of eggs, a fact which was not true of any other of the 'B' type *A. stephensi* whose ova were measured. The Calcutta *stephensi* will be mentioned again when cross-breeding is discussed.

Using the 1,828 ova from 40 Mysore females as a standard, it was found that the measured ova from 'B' type *A. stephensi* caught in other places did not vary from the Mysore ova in their means by more than the limits set by twice the standard deviations of the Mysore means. All the 'B' type of ova averaged 555 microns in length, 204 in breadth, 294 in length of float, averaged 18 ridges on one side of the float, and the floats covered over half of the total length. It should be noted that the number of ridges may be different on the two floats of one ovum but that this does not occur often nor is the difference in number ever large.

The *A. stephensi* of 'M' type from Mysore were caught in the Chitaldrug and Mysore districts but were not found in either Bangalore or Mysore city. The other specimens were

TABLE I  
Measurements of *A. stephensi* ova  
'B' type

	LENGTH (MICRONS)		BREADTH (MICRONS)		LENGTH OF FLOAT (MICRONS)		NUMBER OF RIDGES ON FLOAT		PROPORTION: LENGTH OF FLOAT OVER LENGTH	
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
Mysore State— 40 females 1,828 ova	553.62 ± 0.40	25.15 ± 0.28	200.09 ± 0.19	11.89 ± 0.13	286.73 ± 0.36	22.58 ± 0.25	17.92 ± 0.03	1.74 ± 0.02	0.516 ± 0.0004	0.028 ± 0.0003
Delhi— 21 females 895 ova	558.09 ± 0.45	20.14 ± 0.32	212.92 ± 0.19	8.35 ± 0.13	309.17 ± 0.42	18.47 ± 0.29	18.43 ± 0.03	1.27 ± 0.02	0.553 ± 0.0005	0.021 ± 0.0003
Poona— 1 female 45 ova	585.33 ± 1.12	11.10 ± 0.79	205.33 ± 0.66	6.57 ± 0.47	293.56 ± 1.07	10.60 ± 0.75	17.24 ± 0.10	0.97 ± 0.07	0.503 ± 0.001	0.014 ± 0.001
Calcutta— 6 females 220 ova	544.59 ± 0.99	21.78 ± 0.70	205.95 ± 0.32	6.96 ± 0.22	291.27 ± 0.80	17.58 ± 0.57	17.90 ± 0.05	1.08 ± 0.03	0.536 ± 0.001	0.028 ± 0.0009
All 'B' type— 68 females 2,988 ova	554.92 ± 0.30	24.27 ± 0.30	204.44 ± 0.15	12.04 ± 0.11	293.89 ± 0.29	23.24 ± 0.20	18.06 ± 0.02	1.58 ± 0.01	0.528 ± 0.0004	0.031 ± 0.0003

only. Those from Delhi were sent by Major Afridi and Doctor Puri, to whom we are greatly indebted, as we also are to Doctors Barber and Rice for assistance in the catches at Poona. From Calcutta we received specimens reared in the School of Tropical Medicine and very kindly sent to us by Doctor B. C. Basu to whom we are grateful. These Calcutta specimens were the only ones recorded in tables I and II which were not caught wild and it should be noted that it was only with great difficulty and after repeated blood meals that a very few of the Calcutta specimens could be induced to lay

caught by Doctor C. Cheluvareyan of the Mysore State Department of Health during a trip north and we are indebted to him as well as to all the local health officers and sanitary inspectors who were of great assistance to him. Again using the Mysore average as a standard (112 females and 5,258 ova), there was, with one exception, no variation in the means greater than twice the standard deviations of the respective Mysore means. The exception was in the case of the ova laid by one female from Poona which averaged in length 49.21 microns less than the Mysore ova, 2.51 times the

TABLE II  
Measurements of *A. stephensi* ova  
'M' type

	LENGTH (MICRONS)		BREADTH (MICRONS)		LENGTH OF FLOAT (MICRONS)		NUMBER OF RIDGES ON FLOAT		PROPORTION : LENGTH OF FLOAT OVER LENGTH	
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
Mysore State— 112 females 5,258 ova	469.96 ± 0.18	19.58 ± 0.13	157.17 ± 0.09	10.15 ± 0.07	213.80 ± 0.17	18.34 ± 0.12	13.40 ± 0.01	1.28 ± 0.003	0.454 ± 0.0003	0.033 ± 0.0002
Sukkur, Sind— 11 females 535 ova	504.92 ± 0.57	19.39 ± 0.40	177.36 ± 0.29	10.00 ± 0.21	242.79 ± 0.41	14.19 ± 0.29	13.81 ± 0.03	0.99 ± 0.02	0.479 ± 0.0006	0.020 ± 0.0004
Hyderabad, Sind— 7 females 303 ova	489.44 ± 0.67	17.26 ± 0.47	159.04 ± 0.42	10.76 ± 0.29	229.27 ± 0.51	13.19 ± 0.36	13.95 ± 0.04	0.90 ± 0.02	0.467 ± 0.0007	0.017 ± 0.0005
Poona— 11 females 530 ova	505.72 ± 0.50	16.95 ± 0.35	170.74 ± 0.28	9.46 ± 0.20	232.62 ± 0.48	16.51 ± 0.34	13.52 ± 0.04	1.21 ± 0.03	0.458 ± 0.0008	0.028 ± 0.0006
Poona— 1 female 40 ova	420.75 ± 1.68	15.77 ± 1.19	139.25 ± 1.14	10.66 ± 0.80	194.00 ± 1.20	11.12 ± 0.84	14.03 ± 0.08	0.77 ± 0.06	0.458 ± 0.002	0.019 ± 0.001
All 'M' type— 142 females 6,666 ova	476.20 ± 0.20	23.71 ± 0.14	159.86 ± 0.10	12.06 ± 0.07	218.20 ± 0.17	20.02 ± 0.12	13.47 ± 0.01	1.24 ± 0.007	0.457 ± 0.0003	0.032 ± 0.0002

standard deviation of the Mysore mean length. These ova, however, were included in the general means to make the measurements for the 'M' type of *A. stephensi* ova average 476 microns in length, 160 in greatest breadth, and 218 in length of float, with 13 ridges on one side of the float, and the floats covering less than half of the total length of the ova. After considering the standard deviations of the various means, there seems no question of the significant differences in measurements between 'B' and 'M' ova.

It is of interest to note that from Poona we received eleven females which laid ova definitely of the 'M' type, one female with ova considerably shorter in length than the 'M' average but otherwise not significantly different, and one female which laid ova characteristically 'B' in type. From the data we have, we cannot say that this would not have been true in the other places from which we received specimens, had longer searches been possible. In Calcutta also it seems probable that both types exist, as will be mentioned later.

The measurements given by Stephens and Christophers (1902) and repeated by Christophers and Barraud (1931) do not fit in well with the measurements of the two types of ova here described. The length they report of 0.51 mm. might be in either 'M' or 'B' type, but the breadth of 0.19 mm. is quite definitely of the 'B' type; the number of 15 for ridges on the float might be in either 'M' or 'B', but the

statement that the floats cover half or less of the ova sounds more like the 'M' type. It should be noted that they mention two distinct types of breeding places and it seems quite possible that their measurements were of ova from different females, some 'M' and some 'B', and that their averages present a composite picture of the two types of ova.

#### *Influence of climate and breeding conditions*

It is not possible as yet to be very definite as to the effect of climate on *A. stephensi* ova but what evidence there is would seem to be against its having any effect on their measurements. From as widely different climatic conditions as obtain in Bangalore, Delhi, Poona and Calcutta we have received specimens of 'B' type, with the same being true of 'M' type specimens and, furthermore, there has been no evidence in the Mysore State specimens of any change in measurements of either 'B' or 'M' in different seasons of the year. Only 'B' type specimens are found in Bangalore and Mysore cities, 87 miles apart, but only 'M' type in an area between them.

Variations in breeding places of *A. stephensi* were noted as long ago as 1902 when Stephens and Christophers published their original ova measurements and have been mentioned many times since, most references being to a well and artificial container, city breeder as opposed to a more general breeder in rural areas. From our experience we can say that the city breeder is

as a rule of the 'B' type while the rural specimens are usually 'M'. However, this is not always true as in one small town in Mysore where *A. stephensi* breed in wells we have been able to find 'M' type specimens only. In another area, 'M' type *A. stephensi* breed in wells while the river is high but go back to the river and nullahs during drier seasons. As far as we can tell at present, breeding places and conditions are not a determining factor in egg size.

That such a variation in ova is not a phenomenon common to other anophelines is shown by our measurements of 1,994 ova from 56 female *A. culicifacies* caught in Mysore State and several places in North and Central India. A report on these measurements will be published later but it may be said here that we could find no significant differences in measurements of *A. culicifacies* ova from any part of India from which we got specimens.

#### *Differences in larvæ and adults*

We have not been clever enough as entomologists to detect any constant differences between the larvæ and adults of types 'M' and 'B' *A. stephensi*. It seems possible that if such differences are found they will be in two or more characteristics and of average value only, as is the case in the varieties of *A. maculipennis* of Holland, as described by Swellengrebel *et al.* (1936). No measurements were made of wing lengths, nor were male genitalia studied.

There was apparently some difference in size of adults, type 'B' usually being the larger of the two, but this was by no means absolute and size had no determinable effect on the measurements of the ova. When the Sukkur specimens were first received they were judged to be of 'B' type from their size but, nevertheless, they laid 'M' type ova. Further, when 'B' type larvæ receive poor food they hatch into small adults but still lay eggs well within the average measurements of the ova of large 'B' specimens, hatched from well-fed larvæ.

*A. stephensi* of 'B' type seem to be the hardier specimens and are longer-lived than those of 'M' type. The former take human blood meals with avidity and are easily fed in captivity by putting the hand or arm in a suitable position, while it is always difficult to get 'M' females to take blood, either human or other, although there is an impression that they will feed on a rabbit more readily.

Unfortunately, it has not as yet been possible to test the source of blood meals in stomachs of wild *A. stephensi* of either type. It may be difficult to get sufficient specimens of 'B' type for such tests, since control work is being done in so many of the places in which this type has been found.

#### *A. stephensi as a carrier of malaria*

(1927 and 1931) in two reviews of malaria carriers of malaria gives information

as to infections reported in *A. stephensi*. Experimental infections have been reported from Nagpur, Ennur, Bombay and the Punjab and natural infections from Delhi, Lucknow, Bombay, Mopad in Madras, and Kohat. Laboratory reared *A. stephensi* have been used in Calcutta and these specimens are found readily infectible with malaria, as Knowles and Basu (1934) report infections with *P. vivax* in colony *A. stephensi* varying in different seasons of the year from 22.0 to 72.0 per cent. According to Covell's lists, negative results were reported by Ross in dissecting 70 *A. stephensi* in Cuddapah, by Mayne in dissections of 248 of this species in Saharanpur, and by Sur and Sur in 21 specimens dissected in Krishnagar, Bengal. In Mysore, Sweet and Rao (1931) and Nursing, Rao, and Sweet (1934) reported examinations of 3,198 *A. stephensi* stomachs with five (0.2 per cent) having oöcysts and of 3,162 glands of which none showed sporozoites. All of these Mysore *A. stephensi* were from areas since found to have only type 'M' *stephensi*, as no dissections were done in Mysore and Bangalore cities where type 'B' is found.

Specimens of *A. stephensi* received from Delhi and from the Calcutta colony were of type 'B' but unfortunately it was not found possible to get any specimens from Bombay and the other places from which natural infections have been reported. It is suggested, however, that these places have type 'B', and that Saharanpur, Cuddapah, and Krishnagar will be found to have type 'M' *stephensi* as is the case in those parts of Mysore where largely negative dissections of this species have been made.

Mulligan and Baily (1936) report the dissection of 719 *A. stephensi* in Quetta with a finding of six gut and two gland infections. The infection rate of 609 specimens caught in villages and rural areas was 0.5 per cent as against a rate of 3.7 per cent in 109 captured in the railway and police lines, the military area, and the civil hospital, presumably all more or less in the city areas. Mulligan and Baily say, 'It is well known that, in certain parts of India, *A. stephensi* is a highly efficient malaria carrier, while in other parts it appears to be less important. So far as Quetta is concerned, the relative inefficiency of *A. stephensi* as a malaria carrier may be attributable to the presence of a "race" of *stephensi* which is less androphilic than those which occur in certain other places'. A member of our staff who visited Quetta was unable to find *A. stephensi* at that time of year, but it seems possible that Quetta may have the two types of *A. stephensi*, 'B' in the city and 'M' in the villages. We could not determine from the tables in the Quetta report whether any gland infections were found in the village dissections.

No records can be found as to the relation to malaria of the *A. stephensi* of Poona and Hyderabad Sind but none of the surveys and studies made in the Sukkur Barrage area has

considered that this species was concerned in transmission there. From the specimens received from these three places, the *A. stephensi* are mainly of type 'M' and quite possibly do not carry malaria. The whole position is still vague and much more work must be done, but there seems a possibility that the two types of *A. stephensi* differ, from one cause or another, in their malaria-carrying potentialities.

#### *A. stephensi* in captivity

Efforts to establish laboratory colonies of the two types of *A. stephensi* began early in this study but no success has been achieved with the 'M' type. Early in the work 'M' males and females were put in a large cage and the males were observed swarming in the top of the cage. However, most of the females died early, in spite of taking blood meals after considerable urging, and only three laid eggs. The ova of one were sterile and did not hatch out and of the other two all the larvæ died. After that six more attempts were made with this type, once in the large cage and later in a small cage. None of

these females could be induced to lay eggs, most of them dying early. Finally on 12th July, 1937, four females, fertilized in the small cage, laid ova which mostly hatched out and the larvæ are developing slowly. Up to date it has not been possible to get beyond this first generation with the 'M' type. The measurements of the ova of these seven females of the first generation are given in table III and their averages are not significantly different from those of the original Mysore 'M' type as given in table II. This type breeds true at least for one generation.

That there is a fundamental difference in the two types in their reaction to captivity is shown by the history of the 'B' type colony. A first attempt to start a colony in the large cage failed, largely because of lack of proper attention, but a later start in the small cage was at once successful. Average measurements of ova from the fifth to the ninth generation are given in table III.

The means of the measurements of 70 ova from two females of the fifth generation were

TABLE III

Measurements of ova of first and succeeding generations of laboratory-bred *A. stephensi* 'M' and 'B' types

	LENGTH (MICRONS)		BREADTH (MICRONS)		LENGTH OF FLOAT (MICRONS)		NUMBER OF RIDGES ON FLOAT		PROPORTION: LENGTH OF FLOAT OVER LENGTH	
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
'M' type, 1st generation— 7 females 297 ova	472.76 ± 0.63	16.17 ± 0.45	157.04 ± 0.29	7.37 ± 0.20	201.82 ± 0.42	10.78 ± 0.30	12.00 ± 0.04	0.97 ± 0.03	0.424 ± 0.0008	0.020 ± 0.0006
'B' type colony, 5th genera- tion— 2 females 70 ova	590.00 ± 1.35	16.75 ± 0.95	219.71 ± 0.71	8.79 ± 0.50	306.71 ± 1.22	15.19 ± 0.87	18.61 ± 0.07	0.85 ± 0.05	0.513 ± 0.001	0.018 ± 0.001
'B' type colony, 6th genera- tion— 8 females 369 ova	612.28 ± 0.54	15.48 ± 0.38	232.07 ± 0.31	8.79 ± 0.22	326.02 ± 0.53	15.14 ± 0.38	19.24 ± 0.04	1.25 ± 0.03	0.534 ± 0.0007	0.019 ± 0.0005
'B' type colony, 7th genera- tion— 16 females 729 ova	609.97 ± 0.77	30.65 ± 0.54	233.83 ± 0.27	10.88 ± 0.27	316.54 ± 0.57	22.84 ± 0.40	18.90 ± 0.03	1.19 ± 0.02	0.519 ± 0.0005	0.021 ± 0.0004
'B' type colony, 8th genera- tion— 21 females 1,024 ova	616.49 ± 0.52	24.68 ± 0.37	231.41 ± 0.21	10.06 ± 0.15	321.66 ± 0.37	17.56 ± 0.26	19.53 ± 0.03	1.31 ± 0.02	0.521 ± 0.0004	0.017 ± 0.0003
'B' type colony, 9th genera- tion— 8 females 385 ova	622.60 ± 0.67	19.57 ± 0.48	227.90 ± 0.40	11.58 ± 0.28	314.83 ± 0.57	16.69 ± 0.41	19.52 ± 0.05	1.59 ± 0.04	0.510 ± 0.0006	0.018 ± 0.0004

not significantly different from those of the Mysore 'B' type but in later generations the lengths varied from 2.2 to 2.7 times greater than the standard deviation of the mean length of Mysore 'B', and breadths varied from 2.3 to 3.0 times greater; the means of the other measurements were not significantly different from those of Mysore 'M'. The comparisons are made with Mysore 'B' since it was from one female (St. 4 My.) of this series that all the original ova were obtained to start the colony. There seemed to be some tendency for reduction in breadth to the type mean of this measurement in the successive generations, but the lengths tended to increase. Since the colony was entirely an in-bred one from one female any dominant tendency to increased length would naturally show up but it should be noted that there was no tendency to decrease in averages towards the 'M' means and that in the main the colony bred true in the measurements of its ova.

#### Cross-breeding

Hackett (1937b) gives a table of the results of crossing of the varieties of *A. maculipennis* in Europe and summarizes it by saying, 'The results were thus of two different sorts: either no viable  $F_1$  generation could be obtained, as is the case, for instance, in attempted crosses between the water buffalo and the cow; or healthy hybrid offspring could be bred from the eggs but they were sexually defective and hence unable to continue the race, as in the case of mules, which are usually, but not in every instance, sterile'. We have attempted cross-breeding with both 'B' females and 'M' males (BM) and *vice versa* (MB).

Two original attempts for a BM cross with very small numbers of insects were unsuccessful, the females refusing to lay eggs in spite of repeated blood meals. Later, however, when 40 'B' virgin females were placed in a cage with 52 'M' males we got ova from nine BM females. Of these the ova from only two specimens appeared entirely normal, hatched out, and produced a  $BMF_1$  generation, the average ova measurements of these two females being entirely within the limits set by the standard deviations of the means of the measurements of the eighth generation of the 'B' colony (table III) from which the 'B' larvæ came. The 'M' males had apparently had no effect on the measurements of these ova in spite of the successful cross. Another BM female laid eggs with type measurements but none of them hatched at all, while from two other females only a small minority of the ova hatched out. The remaining females laid two kinds of ova, a few coming within 'M' type average measurements and the majority being of 'B' type, with only a small minority of either type hatching. With the exception of the first two BM females mentioned, the others laid only a small number of ova, a point which is not true of 'B' females in general.

Dissections were made of five BM females just before they died and active sperms were found in the spermatheca but the remaining 26 BM females refused to lay eggs in spite of repeated blood meals. This again is not characteristic of 'B' females which, as a rule, lay eggs in captivity without difficulty.

Up to the time of writing, four  $BMF_1$  females have laid eggs, the average number per female being much below the usual 'B' average and in one most of the ova being sterile. The average measurements of these  $BMF_1$  ova showed that they were of 'B' type in length and length of float, and in either 'B' or 'M' type in breadth, number of ridges on the float, and proportion of length covered by the floats. Of four  $BMF_1$  females dissected, one had completely undeveloped ovaries and would have been sterile; the other three, of the same age, had normal ovarian development.

The first attempt at a MB cross was made with 10 females of 'M' type and 20 males of 'B' type but none of the females laid eggs in spite of repeated blood meals; eight of these females were dissected just before death and no sperms were found in the spermatheca. A second attempt was also unsuccessful in that all 30 females died without laying eggs although in 20 of them active sperms were found. At a third attempt, eighteen died before ova were obtained, two laid ova and one was still alive at the time of writing. The average measurements of the ova of these two MB females were entirely within the limits of the 'M' type and the ova hatched out into larvæ, still undergoing development. No  $MBF_1$  generation has yet been raised.

These few preliminary cross-breeding experiments gave comparable results to those reported for the crosses of varieties of *A. maculipennis* in Europe. Some of the first crosses were sterile, some laid sterile eggs, and the minority laid fertile eggs which developed into an  $F_1$  generation in which some specimens were fertile, some had totally undeveloped ovaries, and others laid sterile ova. Such a state of affairs in nature would mean that crosses of 'B' and 'M' would probably not survive and would seldom or never be found; of the 204 *wild* females whose ova we have measured there has not been one which had average measurements which made its typing difficult. All this would not seem to indicate a true breeding between members of the same race or variety but much more work remains to be done along this line.

#### The Calcutta *A. stephensi*

As can be seen from table I, six female *A. stephensi* from Calcutta were of type 'B' but it was also mentioned that only a very few of these Calcutta females laid eggs and the number of ova was small. One other Calcutta female (not included in table I) laid eggs which were of 'M' type in length, breadth, and length of float, were of 'B' type in number of ridges on

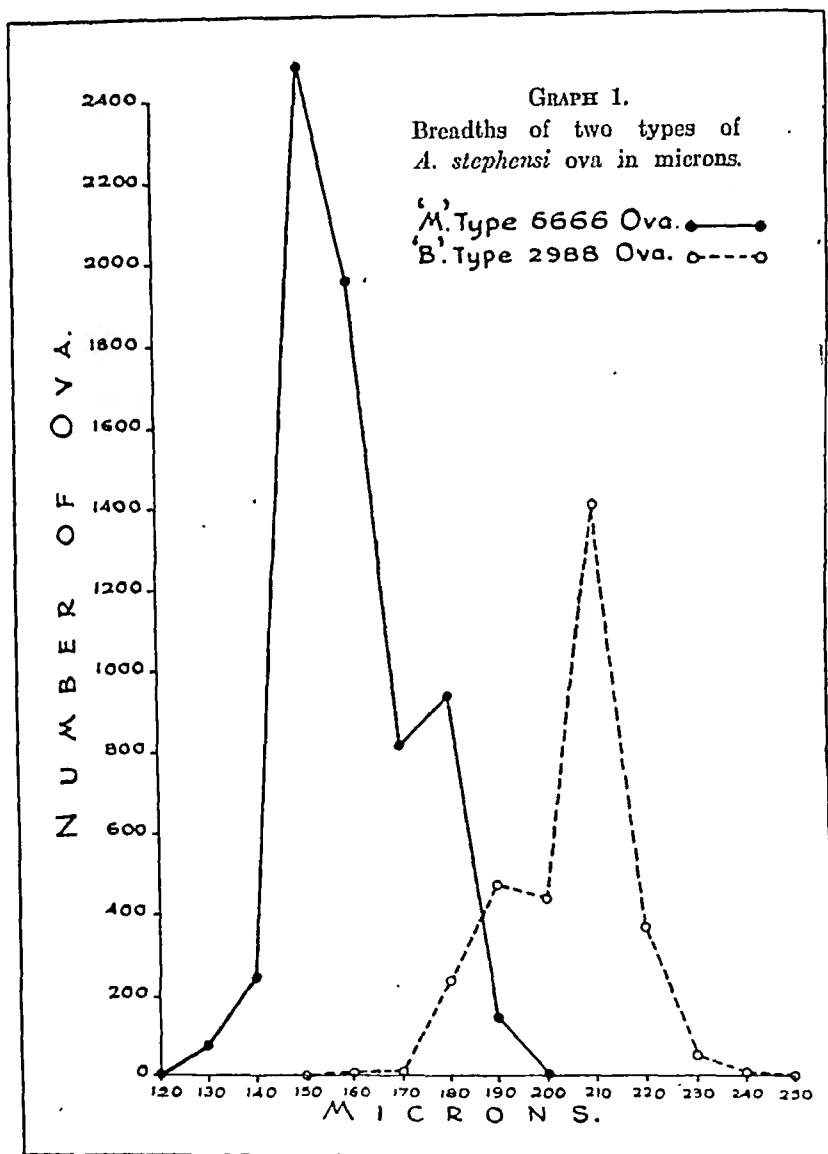


the float and might have been of either type in the proportion of length covered by the floats. An eighth female laid very few ova, most of them not fertile, and of two quite distinct types, about half being 'M' and the other half 'B', except for number of ridges on the float which was of 'B' type throughout. Knowles and Basu (1934) report on longevity that some of their *A. stephensi* lived 14 to 20 days and some only 7 to 9 days, a difference we have noted in our 'B' and 'M' type specimens. This whole

be due to unconscious use of 'M' type one time and 'B' type another, or to the occasional use of laboratory-bred crosses about whose reaction to malaria infection we know nothing?

### Conclusion

On the whole, the evidence available seems to point to two distinct types of *A. stephensi*. So far, the only demonstrable anatomical difference between these types is in the average measurements of length of ova, their greatest breadth

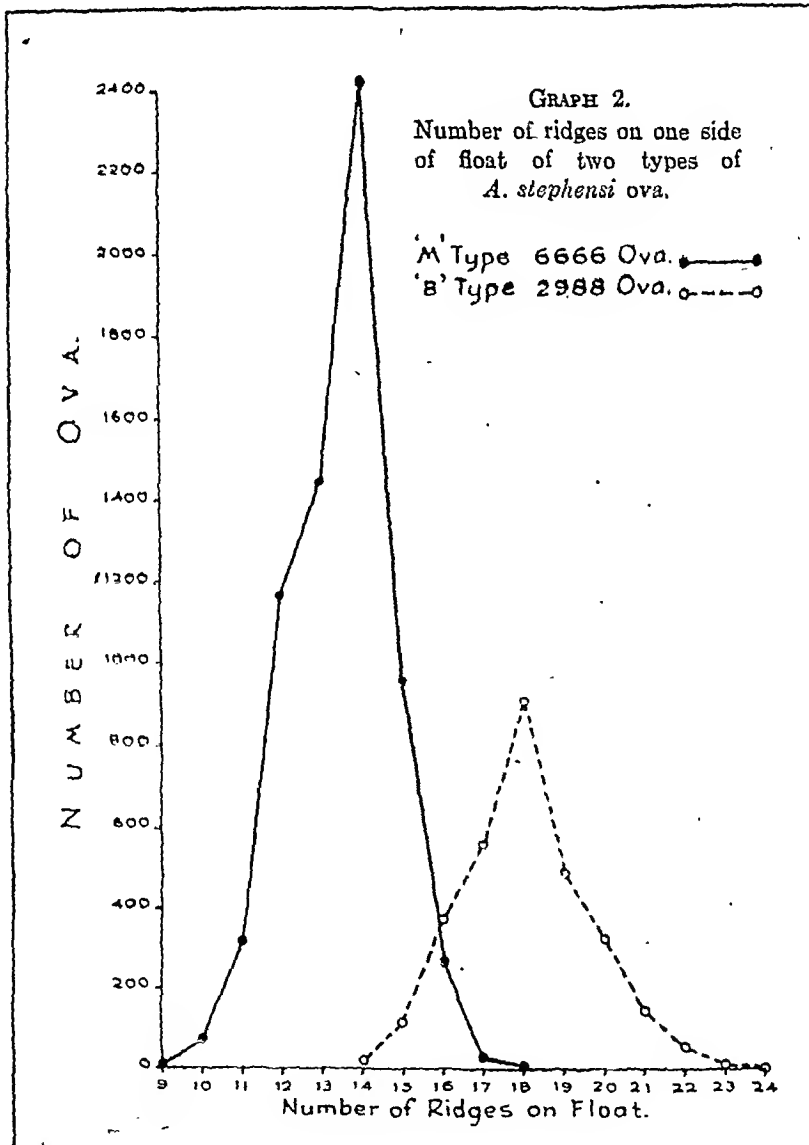


picture is much like that we have found in our BM crosses and BMF<sub>1</sub> generation, and it seems a possibility that both 'B' and 'M' types exist in Calcutta so that laboratory rearing of larvæ obtained from various sources has resulted in some cross-breeding. It is also of interest to note that Knowles and Basu (1934) reported varying rates of infection in *A. stephensi*, a fact they ascribed to temperature and humidity changes. Since it seems possible that there are the two types of *A. stephensi* obtainable in Calcutta, might this difference in infection rates

including floats, the length of the floats, the number of ridges on the float, and the proportion of the total length which is covered by the floats, the 'B' type having the larger measurements in each instance. There seems to be no evidence that climate, breeding place, food of the larvæ, or size of female have any effect on the measurements of the ova, and measurements of *A. culicifacies* ova do not show that in this species there are any significant differences in averages. 'B' type *A. stephensi* seem to be hardier than 'M' type, to live longer in captivity, and to feed

avidly on human blood, while 'M' type females are induced with difficulty to feed on any blood and leave the impression that they prefer animal blood. There is a difference between the two types in willingness to lay eggs in captivity, the 'B' type being easy layers. In captivity, a 'B' colony is easily established, carries on readily, and breeds true at least through the ninth generation, while we have not succeeded in establishing an 'M' colony and only seven

A word of caution is necessary. The differences in ova measurements are average differences and a glance at graphs 1 and 2, which give the numbers of ova in each class of breadths, and numbers of ridges on the float, will show that individual ova may be misrepresentative of the type to which the female belongs. However, we have never found a *wild* female *A. stephensi* which could not be immediately placed in one type or the other on the basis of two or more of



females of the  $F_1$  generation have laid ova; these seven bred true in egg measurements. In cross-breeding of 'B' females with 'M' males, the results are quite comparable to those reported for the crosses of the varieties of *A. maculipennis* in Europe. Evidence as to the malaria-carrying potentialities of the two types is still vague but seems to point to 'B' being a good carrier and to 'M' not being so. Work is continuing along all these lines and in other directions.

the average measurements of from 20 to 50 ova, and usually on the averages of even less than 20. There is, moreover, a difference in the physical appearance of the ova, under the microscope, which enables one with experience immediately to classify a group of ova as either 'B' or 'M'; the measurements then become confirmatory.

These two types of *A. stephensi* ova have been referred to as 'B' and 'M' (Bangalore and

Marikanave, from which places the first females were obtained), but considering all the evidence and to avoid confusion, it seems best to suggest that the 'B' type retains the name of

*A. stephensi*, type form, and that the 'M' type be called *A. stephensi* var. *mysorensis*. The average ova measurements of these two types are as given in table IV.

TABLE IV

Mean ova measurements and their standard deviations of two types of *A. stephensi*

	LENGTH (MICRONS)		BREADTH (MICRONS)		LENGTH OF FLOAT (MICRONS)		NUMBER OF RIDGES ON ONE SIDE OF FLOAT		PROPORTION OF LENGTH COVERED BY FLOATS	
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
<i>A. stephensi</i> (type form)	555	± 21	204	± 12	291	± 23	18	± 1.6	0.58	± 0.03
<i>A. stephensi</i> (var. <i>mysorensis</i> )	476	± 21	160	± 12	218	± 20	13	± 1.2	0.46	± 0.03

## APPENDIX A

Measurements of all 'B' type *A. stephensi* ova  
68 females—2,988 ova

LENGTH		BREADTH		LENGTH OF FLOAT		NUMBER OF RIDGES ON FLOAT		PROPORTION: LENGTH OF FLOAT OVER LENGTH	
Microns	Number of ova	Microns	Number of ova	Microns	Number of ova	Number	Number of ova	Proportion	Number of ova
480	4	150	1	210	7	14	17	0.40 and 0.41	4
490	4	160	6	220	15	15	116	0.42	13
500	24	170	14	230	43	16	366	0.44	42
510	136	180	235	240	11	17	553	0.46	105
520	117	190	466	250	49	18	904	0.48	252
530	199	200	435	260	105	19	481	0.50	541
540	687	210	1,401	270	318	20	341	0.52	750
550	337	220	367	280	354	21	141	0.54	713
560	498	230	53	290	855	22	55	0.56	406
570	502	240	9	300	288	23	11	0.58	128
580	127	250	1	310	353	24	3	0.60	33
590	182	..	..	320	406	..	..	0.62 and 0.63	1
600	105	..	..	330	97	..	..	..	..
610	20	..	..	340	50	..	..	..	..
620	26	..	..	350	12	..	..	..	..
630	8	..	..	360	2	..	..	..	..
640	3	..	..	370	13	..	..	..	..
650	7	..	..	380	4	..	..	..	..
660	0	..	..	390	4	..	..	..	..
670	2	..	..	400	2	..	..	..	..
TOTAL	2,988	..	2,988	..	2,988	..	2,988	..	2,988

## APPENDIX B

Measurements of all 'M' type *A. stephensi* ova  
142 females—6,666 ova

LENGTH		BREADTH		LENGTH OF FLOAT		NUMBER OF RIDGES ON FLOAT		PROPORTION: LENGTH OF FLOAT OVER LENGTH	
Microns	Number of ova	Microns	Number of ova	Microns	Number of ova	Number	Number of ova	Proportion	Number of ova
400	7	120	6	150	15	9	10	0.32 and 0.33	3
410	20	130	77	160	42	10	74	0.34	22
420	26	140	244	170	54	11	318	0.36	105
430	233	150	2,483	180	341	12	1,168	0.38	118
440	374	160	1,959	190	421	13	1,440	0.40	373
450	316	170	816	200	485	14	2,415	0.42	879
460	1,256	180	934	210	1,535	15	947	0.44	1,614
470	1,087	190	140	220	1,372	16	261	0.46	1,528
480	1,257	200	7	230	1,116	17	29	0.48	1,377
490	651	..	..	240	675	18	4	0.50	490
500	559	..	..	250	356	..	..	0.52	139
510	549	..	..	260	243	..	..	0.54	14
520	136	..	..	270	10	..	..	0.56 and 0.57	4
530	111	..	..	280	1	..	..	..	..
540	77	..	..	..	..	..	..	..	..
550	6	..	..	..	..	..	..	..	..
560	1	..	..	..	..	..	..	..	..
TOTAL	6,666	..	6,666	..	6,666	..	6,666	..	6,666

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## A MODIFIED VILLAGE MOSQUITO TRAP

By RAMKRISHNA N. GORE, L.M. &amp; S.

Khar, Bombay

ACTING on a valuable suggestion made by the Editor of the *Indian Medical Gazette*, to use a hoop, I have attempted to simplify the working of the village mosquito trap described by Gore (1936) with regard to the arrangement of the pieces of woollen cloth each night, and catching of the mosquitoes every morning, and I have found it much easier to operate than it formerly was.

A bamboo hoop is made to rest just on the outer edge of the mouth of an earthen pot. A piece of woollen blanket such as is used by villagers, the sides of which are hemmed, and two inches shorter than the circumference is sewn on to the hoop (figure 1). The dimensions of the cloth are such that, when introduced into the pot, the lower edge nearly touches the bottom, and a two-inch vertical gap is left open (figure 2), which serves as a passage for mosquitoes to the darker spaces in the pot. Three 12-inch pieces of string are tied to the hoop, the free ends being tied in a knot. This serves to lift the cloth.

The trap is kept at night in a corner which has been previously ascertained to be a resting place of mosquitoes. This is determined by disturbing them from different places and observing where they alight, for a day or two. One trap is kept in each room. The following morning situations other than those where the trap is

laced are disturbed twice between 7 and 8-30 m. This is important since it helps in gather-

heat thus generated will kill the moribund mosquitoes.

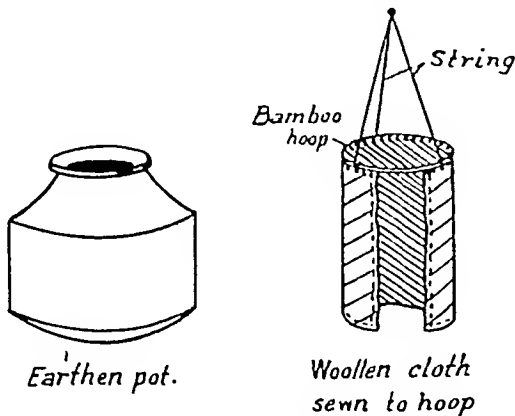


Fig. 1.

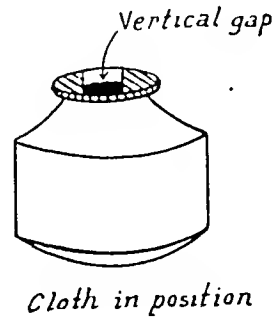


Fig. 2.

ing more mosquitoes in the trap. By 10 a.m. the mosquitoes are at rest.

A metal or earthen dish is put over the mouth of the pot, and with one hand on the dish, the cloth is pulled out by the other hand by means of the strings. A piece of cloth is then put over the dish covering the mouth and tied at the neck of the jar by a string. The mosquitoes are thus caught securely in the pot.

In India there is sunshine for more than eight months in the year. During these days the pot is kept inverted in the sun away from breeze for one hour. The mosquitoes are killed by heat and fall on the dish. The pot, still inverted, is then brought into the house and placed on the floor. The knot is loosened, the string removed and the cloth spread flat on the floor. The pot is raised and shaken a little to bring out any dead mosquitoes that may be sticking inside. Finally the mosquitoes are removed on a piece of paper and burnt.

During the monsoon the mosquitoes are killed by fumigation and heat. This is effected by burning a pinch (3 grains) of tobacco powder spread on a thin layer of cotton, rolled with a four-inch piece of straw or wire and made into a sort of small cigarette. A hole three-fourths of an inch in diameter is made in the side of the pot about half-way from the top. In a wooden plug one inch in length a hole half an inch deep is made. The end of the straw is inserted in the hole. The 'cigarette', well lighted at the tip, is inserted through the hole in the inverted pot. The escape of smoke through the hole is minimized by wrapping a piece of cloth round it at the end. After ten minutes the plug should be removed, to make sure that the tobacco has burnt, and re-inserted. After thirty minutes the mosquitoes can be removed on a paper and put in a small earthen pot or tin. Most of them die but ten to twenty per cent remain moribund and may revive. Mosquitoes from other traps are transferred to this pot. A metal dish is then put over the mouth of this pot and a live piece of dung cake or charcoal is put over it. The

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## EPIDEMIC DROPSY IN CAWNPORE (U. P.)

By N. D. BANERJI, M.B., B.S.

Resident Medical Officer, J. K. Group of Mills,  
Cawnpore

As far as I am aware this is the first time that epidemic dropsy has broken out in Cawnpore. So far 78 cases have come under my observation and treatment. At the time of writing this note the epidemic is still going on. A peculiarity of the epidemic is that it has attacked the labouring classes also. This report in fact deals entirely with the factory workers. It was observed that the epidemic had started when there was very little rain in Cawnpore. The first case which came to me was on the 1st July, 1937, and by then the rainfall was only 2.0 inches and even that was deficient by 50 per cent of the average rainfall of Cawnpore. Moreover, Cawnpore is not a very wet town. The annual rainfall is about 36.0 inches. The average maximum and minimum temperature recorded in Cawnpore during July was 90/80°F. while in September it is 85/77°F. The temperature during the month of August was in between these two readings. The rainfall in the month of August was deficient by more than 50 per cent while in the month of September the deficiency continues. So the present epidemic it seems has not the same relationship with the rainfall as has been observed by Chopra and Bhattacharya (1935). In fact the epidemic curve is more in accord with the basal metabolism curve published in the *Indian Journal of Medical Research* (Banerji, 1931). Therefore we can theorize that, in addition to some unknown cause, the depressed basal metabolic condition of the population is possibly a contributing factor in the epidemiology of epidemic dropsy. As the disease is still prevalent and the

observations are being continued, this paper is in the nature of a preliminary communication.

The various mills, where these cases were seen, employ about 10,000 workers, out of which about 500 are women. These women mostly come from the south of the Jumna river, that is south of Kalpi; not a single case has been reported to me so far from this group of workers. Their diet is practically the same as that of any other worker who has suffered from the disease except in the item of mustard oil which is not consumed by them. Instead they generally use 'til' oil.

The male workers employed consist of U. P. Mohammedans, Mohammedans from Bengal, Bengalis from Bengal and U. P., Ooriyas, Hindus mostly of the U. P., and a few Marwaris, Parsees, Christians, Anglo-Indians and Europeans. From the record of the cases collected so far it appears that the disease has affected each class proportionately except the Europeans, Anglo-Indians, Parsees and Marwaris.

*The ages of the patients.*—The most common ages observed so far are between 19 and 45 years. The youngest is a baby, 11 months old.

*Sex.*—So far I have seen only three women patients suffering from the disease.

*Diet.*—The diets of those affected are all similar except in the case of the Ooriyas and the Bengalis whose staple diet is rice as it is in their own province and they use mustard oil extensively. Nearly all the patients said they had used mustard oil. It should be recorded that a factory for the manufacture of vegetable ghee has been in operation in Cawnpore from about the middle of 1936. Some diet tables for the U. P. have been published by me (Banerji, 1929).

*Signs and symptoms.*—The most frequent complaint of the affected cases is that their feet below the knees swell up in the day while they are working, but at night when resting the swelling diminishes. In a few cases who were working on the night-shift it was observed that the œdema increased in the night and decreased in the day while resting. The pain in the legs increases when the œdema subsides.

*Nervous system.*—Signs of involvement of the nervous system were not observed. No involvement of the eyes could be detected. The heart sounds and its dimensions on the whole are not abnormal when compared with the unaffected persons.

*Fever.*—In the day, some cases had a temperature of 99 to 101°F., some were normal, while most of them had complained that in the night their temperature was appreciably higher than in the day.

*Duration of the œdema.*—Some cases came to our outdoor dispensaries after about 4 days of the onset of swelling while some cases had not reported until after 20 days of the onset.

*Living conditions.*—In the great majority of the cases the workers are living alone. Of those who are living with their families some admit that one or two members are suffering from the

disease, while others say that the members of the family are, so far, free from epidemic dropsy though sharing the same food, which is cooked in the home. Some of the workers are messing together. In these instances the evidence has been of the same nature as in the case of family men.

*Knee jerks.*—When the record is compared with those of unaffected persons not much deviation could be observed.

*Anæsthesia.*—Not a single case complained of this.

*Squeezing test.*—The calf-muscles were pressed and pain was elicited in a great majority of the epidemic dropsy cases.

*Squatting test.*—Nearly all could get up without difficulty from the squatting position on the floor.

*Pulse.*—The volume, tension, rate and frequency did not vary much from the normal. The rate was between 70 and 90 per minute.

*Blood pressure.*—Epidemic dropsy cases recorded a slightly lower figure (100/45). The unaffected group record was 115/55.

*Anæmia.*—The cases which have been observed are not obviously anæmic. Blood counts have not been done.

*Pallor.*—In a few cases this has been noted.

*Cutaneous manifestations.*—Except in one case, who complained of much itching and small vesicular eruptions, nothing of importance has been observed so far.

*Respiration.*—No deviation from the normal: 14 to 24 per minute.

*Breathlessness.*—This is a definite complaint in some of the cases.

*Cough.*—Not much deviation from the normal.

*Constipation and diarrhœa.*—Mostly the cases complain of constipation. Some of them have complained of diarrhœa.

*Urine.*—The epidemic dropsy cases have invariably complained of diminution of the urine. Some felt a slight smarting during micturition. The urine was high-coloured in a great majority of the cases. Albumin was not found except in one case.

*Treatment.*—Before the treatment is started every patient is told not to take rice and mustard oil. He is asked to take germinating gram, vegetables, milk, butter and proteins in the shape of meat, fish and eggs. These are recommended in addition to *chapatees* and *dal*.

For treatment the cases have been divided in the following groups:—

Group I. This group was given tincture *ephedra vulgaris*, tincture *ferri perchloridi*, alkaline diuretic mixture, compound jalap powder, and calcium lactate.

Group II. Sodium morrhuate, colloidal calcium and adrenaline injections and marmite.

Group III. In this group no special medicine is given for the disease but as soon as it is observed that the case is becoming worse he is

(Continued at foot of opposite page)



## THE PROBLEM OF CANCER

By M. G. KINI, M.C., M.B., M.Ch. (Ortho.),  
F.R.C.S. (Ed.)Second Surgeon, King George Hospital, Vizagapatam  
and

K. V. SUBBA RAO, M.B., B.S.

THE control and treatment of cancer is as important a problem confronting the medical profession and requiring immediate solution in

(Continued from previous page)

transferred to one of the other groups for treatment.

Group IV. The same treatment is given as in group I except that tincture of digitalis has been substituted for tincture of ephedra, and magnesium sulphate added.

*Rest treatment.*—Those who were given leave or who left for their villages, on return were found to have recovered wonderfully. There is no doubt that rest and leaving the area where the disease is acquired are very important factors in curing the condition; this has already been observed by previous investigators.

*Results.*—So far no one has died in my group of cases. Mostly the patients are relieved with the above lines of treatment but there are a few obstinate ones which are improving very slowly. So far I have not been able to assess the values of the various lines of treatment. The recording of evidence is still being continued.

I am obliged to Lala Padampat Singhania, M.L.A., Governing Director of the Juggilal Kam-lapat Group of Mills, for kindly giving me full and extensive facilities for the investigation and treatment of the cases. I am also indebted to the Directors of the J. K. Cotton Spinning and Weaving Mills Co., Ltd., J. K. Jute Mills Co., Ltd., J. K. Cotton Manufacturers Co., Ltd., and Lakshmiratan Cotton Mills Co., Ltd., for kindly sanctioning the extra expenditure incurred in treatment and comfort of these special cases.

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[*Note.*—The paper in the *Indian Journal of Medical Research* referred to by the author deals with basal metabolism tests in selected gaol prisoners and his other paper gives diet tables of different classes in the United Provinces. None are mill workers and in none of the diets is rice or mustard oil mentioned, therefore these observations have no bearing on the present series of cases.

The information on the diet of the affected individuals is far too indefinite to be of any value, but as the author states this paper is in the nature of a preliminary report it is to be hoped that no efforts will be spared in obtaining definite information as to possible causes of the disease. This is an exceptional opportunity of throwing new light on the epidemiology of epidemic dropsy, as the outbreak is in an area where it has never before been reported.—EDITOR, *I. M. G.*]

this country, as it is in the countries of the West. In Western countries definite organizations have been started with a view to discovering the cause of cancer and the proper treatment of it. It is the object of this paper to focus attention on the comparatively high incidence of cancer in this country and bring home the urgent need for the institution of measures for the relief of those suffering from this condition.

The history of cancer practically begins with the history of medicine. The first authenticated recorded evidence is found in the Ebers Papyrus in 1500 B.C. Herodotus described the cure for breast cancer in 520 B.C. Hippocrates, the father of modern medicine, gave the first accurate description of cancer. In ancient times, the causation of this disease was vaguely understood and was essentially explained on the basis of the humoral theory. Galen in A.D. 131—203 stated that cancer was due to black bile and this theory held the field until Paracelsus 1493—1597 had the boldness to disbelieve Galen and suggested that it is due to concentration of salts in one locality. Paré 1510—90 was the first to give the name cancer on account of its resemblance to a crab in 'that it is a hard tumour spreading about in the similitude of the stretched-out legs of a crab'. Even he followed Galen's views who believed that 'it is black bile that gets stuck and shut as in a strait'. It is only after the discovery of the blood circulation by Harvey in 1628 and microscopical inspection of small blood vessels by Leeuwenhoek and Malpighi in 1661 that the conception of the humoral theory was given up. Percival Pott was the first to observe that chimney sweep's cancer was due to irritation by soot. This really marks the starting point of all the recent experimental work. In the eighteenth century it gained ground that cancer was infectious and the first experimental work was done by Peyrylthe who injected an emulsion of cancer into a dog; all he produced was a bad abscess. His maid-servant who saw the sufferings of the dog, took pity on it and promptly drowned it. In the nineteenth century Schwann who demonstrated that the egg is a single cell and all the cells are derived from it, and the whole is made up of these cells united in a specific way, laid the foundations of the conception of the cellular structure of the body. Later Virchow worked and elaborated the cellular pathology which enables us to understand the structural variations and unrestricted proliferation of certain cells in cancerous conditions, though this threw little light on why the cells undergo a malignant change. Various have been the theories with regard to the causation of cancer and the method of its spread. From the Galenic humoral view of carcino-genesis to the present conception of a peculiar change in the cell which multiplies without control and without subserving any function at the expense

of its host, the worker in this field is confronted with much confusion of thought that formerly existed and still exists in spite of the great efforts that have been made to understand the histo-pathology and biochemistry of cancer. It is noteworthy that the knowledge that cancer is found in lower animals has helped greatly the experimental study of carcino-genesis. Domestic animals such as mice, rats, dogs, cats, cattle, sheep, rabbits, fowls, canaries, turkeys, geese and trout have been observed to be subject to cancer. Even the vegetable kingdom is not immune from cancer-like growths such as the cabbage club-root and nodular growths of the tobacco plant. The modern views are many and varied. The discovery of virus infections by Pasteur and Warburg's observations that cancer cells can multiply without oxygen and break up a lot of sugar have opened out new fields in the investigation of this terrible disease.

In India, there is no organized scheme of recording so as to find the true incidence of cancer. Sporadic attempts have been made to find out the incidence of this disease. With the object of the correct assessment of the incidence (total regional, sexual, occupational, etc.) of cancer in this area one of us (M. G. K.) has kept a register of case records of those suffering from cancer attending the clinic both out- and in-patient. Clinical photographs and biopsy histological reports are incorporated whenever possible with the notes of the history and clinical condition. The following statement attached shows the incidence of cancer according to anatomical situation. There were 52 cases of cancer of the palate, 52 cases of cancer of the penis, 50 cases of cancer of the tongue and 46 cases of cancer of the breast in a total of 335 cases. Cancer of the large bowel showed an abnormally high incidence. As many as 18 cases out of 335 were cases of cancer of the large bowel. It is interesting to note that all the cases of cancer of the penis were among Hindus and all the cases of cancer of the palate gave a history of smoking cigars with the lighted end inside the mouth—a peculiar habit particularly adopted both by the men and women of the poorer classes in this locality. It is possible that the chronic irritation resulting from the lighted end inside the mouth caused the cancer of the palate, in a way similar to that by which the *kangri* cancer of the umbilicus is caused among the people of Kashmir. There was a case of cancer of the penis in 1933 in a child aged 2 years, which was successfully treated by partial amputation and radiation. Most of the cases of cancer of the breast that were admitted were in an advanced condition. Of the 46 cases, 2 were in men and 44 in women. Of the 44, one proved to be a case of sarcoma of the breast.

Of the 335 cases, 92 were coolies, 86 were cultivators, 15 were educated middle class men, 20 were poor class people without any occupation. The remaining 122 could not be classified

under any of the above heads as the data were insufficient.

Of the 335 cases, 44 came from Ganjam district, 99 from Godavari district, 134 from Vizagapatam district and 58 came from other parts of the country.

Most of the cases were in an advanced stage of the disease.

The following statement shows the condition on admission :—

(1) Operable	..	35 cases.
(2) Fit for treatment by radium	87	"
(3) Inoperable and unfit for any kind of treatment	..	213 ..

Among the cases treated by radium a very small percentage was inoperable. Radium, however, was used to alleviate the distress. In the majority of cases, radium was used in early conditions. The total stock of radium available here being only 81 mgm. and this having to satisfy the needs of several departments, it was a difficult problem to get the radium when required. Cases selected for treatment by radium often had to wait a long time until it was available. The result is that in some of the cases, while waiting for treatment, dissemination occurs.

The following cases were treated with radium :—

Epithelioma, abdominal wall	..	1
" alveolar margin	..	6
Cancer, breast	..	11
" cheek	..	9
" fauces and pharynx	..	1
" leg	..	1
" lips	..	3
" palate	..	24
" penis	..	22
" scalp	..	2
" thyroid	..	2
" tongue	..	5
TOTAL	..	87

The attached table eloquently illustrates the incidence of cancer in Andhra Desa and shows the need of better equipment for treatment of cancer. At present the facilities for treatment here are far from satisfactory. Most of the cases come in an advanced stage of the disease. Modern equipment such as an adequate supply of radium and deep x-rays must be made available if the treatment of this dreadful condition is to be at all effective. It is a well-known fact that there is no one definite cure for cancer. It is necessary that propaganda about the early diagnosis of cancer must be carried on in the same way as it is being done for tuberculosis and leprosy. Having no previous statistical records it is difficult to say that cancer is on the increase but it is a well-known fact large hospitals become crowded with cases of cancer. Because of the inadequacy of the equipment for modern methods of treatment it is impossible to treat them in the way it is done in other civilized countries.

*Note.*—We publish this paper because at present it is only by the accumulation of such records from various parts of the country that it is possible to form an estimate of the incidence of malignant disease. At the same time such information would be more valuable if some indication were given of the total number of

hospital patients and a rough idea of the population from which these cases were drawn. In spite of its sketchy nature this paper clearly shows that the part of India referred to is no more immune than the rest of the country, or of the world, from the ravages of cancer.—EDITOR, *I. M. G.*

*Statistics of cancer cases from 1931 to 1934 compiled by House Surgeon Dr. K. V. Subba Rao*

Cancer locality	Total number of cases	AGE			RELIGION				SEX	
		Average	Youngest	Oldest	Hindus	Mohammedans	Christians	Anglo-Indians	Males	Females
Abdominal wall	2	37.5	30	45	2	..	..	..	2	..
Alveolar margin and jaw.	13	45.5	32	60	13	..	..	..	10	..
Arm ..	2	60	..	..	1	1	..	..	2	..
Breast ..	46	34.2	25	65	45	..	..	1	2	44
Check ..	26	47	30	60	26	..	..	..	18	8
Fauces and pharynx.	13	41	30	60	13	..	..	..	11	2
Glands, primary or secondary.	8	50.3	35	60	8	..	..	..	5	3
Groin ..	8	36	30	40	8	..	..	..	7	1
Intestines, large	18	40	24	50	18	..	..	..	13	5
Legs ..	3	39	22	60	3	..	..	..	3	..
Lips ..	14	47.4	30	70	14	..	..	..	11	3
Liver ..	5	41	30	61	5	..	..	..	3	2
Palate ..	52	42.5	30	60	52	..	..	..	40	12
Pancreas ..	2	45	30	60	2	..	..	..	1	1
Penis ..	52	45.3	30	60	52	..	..	..	52	..
Prostate and bladder.	3	48	40	50	3	..	..	..	3	..
Scalp ..	4	43.3	35	50	4	..	..	..	3	1
Stomach ..	10	46.6	40	60	10	..	..	..	9	1
Thyroid ..	4	43	40	50	4	..	..	..	2	2
Tongue ..	50	42.6	30	65	47	1	2	..	38	12
TOTAL ..	335	..	..	..	330	2	2	1	235	97*

\* Three cases appear to have been omitted from this column.—EDITOR, *I.M.G.*

## A Mirror of Hospital Practice

### A CASE OF INDIAN TYPHUS

By C. J. HASSETT

CAPTAIN, I.M.S.

*Lady Minto Swat Hospital, Malakand*

THE patient, a Hindu male, aged 35 years, was admitted into the Lady Minto Hospital, Malakand, with fever and headache for ten days and loss of consciousness for five days. His relatives stated that his illness began with fever and headache and that he had been normal in every way until the present attack.

*Physical examination.*—He was in a state of muttering delirium. The tongue was coated, with sordes on the teeth. The face was flushed. Temperature—103°F. Pulse—130. The conjunctivæ were red and injected. Pupils reacted normally. Throat normal. He did not talk when spoken to and resisted examination.

Chest—moist râles all over; no dullness.

Abdomen—liver normal. Spleen enlarged one finger-breadth below the costal margin. No tympanitis.

Constipation present for the past three days. Bladder normal.

Nervous system—corneal reflexes normal. Head retracted and neck muscles rigid. Abdominal reflexes normal. Deep reflexes brisk. No clonus. Plantar reflex normal. Kernig's sign positive.

Circulatory system—heart sounds normal. Apex beat in normal position. Pulse—135 per minute, soft and rapid.

Rash—a macular purplish rash was present which was most noticeable on the abdominal flanks, side of the chest and on the back.

It was also present on the limbs, face, palms of the hands and soles of the feet though not so noticeable in this latter situation. The macules were 5 to 6 mm. in diameter. There were no papules observed. The rash did not fade on pressure though the surrounding skin paled somewhat. With the termination of the pyrexia it began to subside and disappeared completely in six days after the temperature had been normal.

There was no glandular enlargement anywhere.

*Laboratory findings.*—Urine—specific gravity—1035, albumin—present, sugar—nil, casts—nil.

Blood—negative for malaria parasites. Total white cells 13,000 per c.mm. Differential count—polymorphonuclears—77 per cent, lymphocytes—20 per cent, mononuclears—3 per cent. Blood culture—negative. Widal reaction—negative. Weil-Felix test on the 11th day of pyrexia—OX2 1—1,000, OX19 1—1,000, OXK 1—50, OXM 1—50, Kahn's test +. Wassermann reaction +.

Cerebro-spinal fluid—250 cells per c.mm. Nonne-Apelt test—negative.

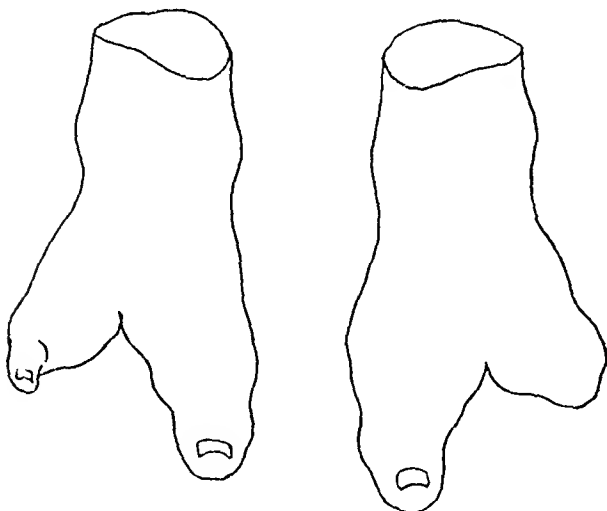
*Treatment.*—On admission a lumbar puncture was performed on account of the meningeal symptoms. The cerebro-spinal fluid was clear and came out under pressure. In all 30 c.cm. were removed. This improved his general condition in that his delirium passed off and three hours later he answered questions normally and intelligently though lassitude was very evident. Treatment, otherwise, was symptomatic. Bronchitis cleared up with the defervescence of the fever. On the fourth day, however, he developed a flaccid paralysis of the left arm. He was unable to lift the limb from the bed and could only make a weak and ineffectual effort to grasp the examiner's hand. The tendon reflexes were lost. There was no loss of sensation. He was given massage and faradism for the affected limb; on the fifth day there were signs of the power returning and by the seventh day it was completely restored though the arm was somewhat weak. Since his discharge from the hospital he has had no further trouble with it.

### A CASE OF SYNDACTYLISM

By N. D. BANERJI, M.B., B.S.

Resident Medical Officer, J. K. Group of Mills,  
Cawnpore

ON the 24th June, 1937, B., aged 31 years, weaver, met with an accident showing a longitudinal confused wound all along the volar and dorsal aspects in one of his fingers of the right hand. As the nature of the injury was rather unusual, I examined his fingers more carefully and found that the middle and ring fingers



Right.

Left.

of the right hand were joined together (syndactylism). The longitudinal wound was situated not exactly on the phalangeal bones but it was on the web between the middle and ring fingers. Seeing this abnormality I examined his lower extremities and found that there were only two toes of huge dimensions on both the feet. Such a case of syndactylism and macrodactyly is not very frequent.

### USE OF PRONTOSIL ALBUM IN CELLULITIS OF THE HAND

By R. M. KASLIWAL, M.D. (Luck.), M.R.C.P. (Lond.),  
D.T.M. & H. (Eng.)

LIEUTENANT, I.M.S.

Officer Commanding, Post Hospital, Midnapore

L. R., a mechanic, aged 25, reported to the hospital on 22nd June, 1937, for a swelling of his left hand which was more marked in the region of hypothenar eminence. He was given four-hourly hot fomentations and the following day an incision about an inch long was made, and a little purulent discharge was pressed out. The wound was dressed with eusol and the patient was advised to attend hospital morning and evening for dressings. In spite of the incision which was made in the most prominent and dependent part of the swelling and a fairly good flow of discharge from the wound, the swelling of the hand, on the whole, began increasing.

The dressings as usual were changed twice daily and a little slough and dead tissue were removed from inside the wound but the swelling did not show any sign of abatement.

On the 26th morning the patient looked very pale and ill. The swelling had almost extended to the elbow joint and the general constitutional symptoms were very marked, with temperature 103°F., pulse 110 per minute and the local examination of the wound revealed a good deal of fairly thick slough and necrotic tissue in and around the wound, some of which was clipped by a pair of scissors, and eusol dressings were applied with a gauze drain about  $\frac{1}{2}$  inch deep and the patient was detained in the hospital. At the same time he was put on prontosil album 2 tablets (gr. 5 each) thrice daily after meals, i.e., 6 tablets were given on the 26th.

On 27th, the patient appeared slightly better. Temperature 100°F., pulse 96 per minute. The slough inside and around the wound had softened and there was a free flow of purulent discharge from the wound. It was dressed with eusol twice and eight tablets of prontosil album were given. Bowels were constipated. He was given an ounce of liquid paraffin at night and a soap and water enema next morning.

On 28th the patient had markedly improved and the swelling had considerably diminished and it was now confined to the hand only. He was given six tablets. Temperature was normal, pulse 76. Patient looked cheerful.

He was kept in the hospital for another seven days, wound dressed morning and evening with eusol. Gradually the swelling of the hand subsided and healthy granulation tissue appeared and the wound was practically healed up by the 5th July, when the patient was discharged much improved.

### Summary

A case of cellulitis of the hand treated with eusol dressings along with oral administration of prontosil album is described. It is evident that the actual improvement of the case started from the day he was put on prontosil. It is difficult to say whether the successful issue of the case was due to this agent, as the treatment was certainly combined with gauze drainage and change of dressings twice a day. But clinically it seemed to appear that possibly the timely use of this drug did considerably help in improving the general as well as the local condition of the patient. Bacteriological examination of the pus could not be made and hence the causative organism was not identified.

# Indian Medical Gazette

NOVEMBER

## SNAKE VENOM IN THERAPEUTICS

THE association between snakes and medicine is as old as medicine itself and everyone is acquainted with the symbol of *Æsculapius* which is almost universally employed to the present day, as the badge of those engaged in the art of healing.

Ancient spells and symbols contained various parts of the bodies of snakes and great efficacy was ascribed to their use, and up to the Middle Ages these weird and sometimes horrible concoctions were in use. As the science of medicine progressed and more rational remedies came into use it was natural that doubt should be cast on the supposed therapeutic value of such materials by the more enlightened members of the medical profession. The result was that crude preparations of parts of animals and their excreta fell into disuse as aids to healing.

The first scientific study of snake venom was begun by Calmette about forty years ago, but only with the idea of producing curative preparations for the treatment of snake bite itself. This work, however, stimulated a detailed and thorough chemical analysis of snake venoms all over the world with the object of devising better methods for the preparation of anti-sera and other remedies for snake bite. Snake venoms are very complicated substances consisting of various toxic substances, enzymes in the form of neurotoxin, fibrolysin, hæmolysin, thrombin, etc. These substances are on the whole specific for each group of snake; for instance, colubrine venom is very different in its effects from the venom of vipers, and evidence is accumulating that even the venoms from the allied species of snakes, in different parts of the world, vary somewhat in their pharmacological actions.

For a long time claims have been advanced that persons who were suffering from certain severe diseases appeared to undergo a remarkable cure if they happened to be bitten by a snake. Though at first scientific physicians viewed such reports with scepticism, with the advancement of scientific knowledge a broader outlook has led to efforts being made thoroughly to examine the pharmacological action of snake venoms to see if such claims have a rational basis.

Sufficient data are not yet accumulated to allow of a definite statement regarding the value of snake venoms in certain diseases, but some of the reports are distinctly encouraging. For instance, the venom of Russell's viper is a valuable local hæmostatic. It contains a coagulant which very rapidly brings about clotting in

normal and even in hæmophilic blood both *in vitro* and *in vivo*. It has been demonstrated that one drop of Russell's viper venom in a concentration of 1/1,000 will cause clotting of ten drops of hæmophilic blood in seventeen seconds, and its effect is not lost even in such a high dilution as 1 in  $10^{18}$ . The effective dilutions are so high that no objectionable or dangerous symptoms are likely to arise. This is to be expected, for the minimum lethal dose of Russell's viper venom was estimated by Acton and Knowles to be 42 milligrammes and several litres of a 1/100,000 dilution would be required to supply such an amount. This venom is now in common use in dental surgery, tonsillectomy, capillary oozing from any cause, epistaxis, hæmophilia, etc.; in other words, in uncontrollable hæmorrhage from any cause in which ordinary surgical hæmostatic methods are not applicable; a solution of 1/100,000 of this venom is used and it never gives rise to any objectionable or urgent symptoms. In America the venom of the water moccasin is being similarly used as a general hæmostatic and the reported results are equally favourable.

More recently a good deal of pharmacological and therapeutic work has been done on cobra venoms to see if they also may have any useful therapeutic applications. Some of the most important of this work has been done at the Calcutta School of Tropical Medicine by Colonel Chopra and his co-workers. In this type of venom the neurotoxic principle is present in relatively much greater proportion than in the viperine type. This nerve poison has a strongly depressant action on the central nervous system and it has accordingly been tried in many diseases of nervous origin. There is also some evidence that it is a powerful analgesic in certain painful conditions such as advanced cancer, leprosy, neuralgias and neuritis from various causes, and it is found of special value when opium is contra-indicated or has lost its effect from prolonged use. It has the further advantage over morphia that it does not appear to lower the patients' general resistance, but it has no specific effect on any of the primary diseases which have caused the pain. The dose of cobra venom is 0.1 to 0.01 of a milligramme (1 to 10 mouse units) which is 1/150 to 1/1,500 of the minimum lethal dose, therefore the chance of producing toxic effects with it is negligible. There is a considerable amount of personal idiosyncrasy in the degree of reaction, so the optimum dose must be determined for each person.

It had been noted that epileptics, after recovering from a snake bite, were sometimes free from attacks for many years, and this has led to the trial of different venoms in the treatment of epilepsy, and in some cases beneficial results have been claimed. But other observers have noted an increase in the severity and frequency of the convulsions if venom alone, without adjunct sedative treatment, was employed. It is

therefore not possible in the present state of our knowledge to assess the value of snake venom in the treatment of this disease. One theory of the action of snake venom in epilepsy is that a certain proportion of cases have an allergic basis, and in these benefit is derived from venom treatment by a process of non-specific protein desensitization, and following on this reasoning, it has also been tried in other allergic states such as asthma, hay fever and migraine.

Even in the small doses used a certain number of persons appear to be sensitive and in some of them local reaction in the form of redness, itching and swelling has been noted at the site of injection, while others exhibit general symptoms such as malaise, a slight rise of temperature and perhaps gastro-intestinal irritation. A few persons have complained that, instead of relieving pain, cobra venom has caused its exacerbation. It is thus clear that the therapeutic effects of snake venom are at present by no means uniform and so it has to be used with caution, as the results cannot be foretold. There is some ground for the belief that some samples of snake venom that have been used in this way

have been badly prepared and that the objectionable effects noted are caused by impurities that are not found in correctly isolated samples, so there is hope that when the method of preparation is properly standardized, venoms will be found more regular in their action.

From this brief outline it is clear that snake venoms are beginning to become established in therapeutics. It is possible that, like nearly all new remedies, they are being tried too severely and that the large number of uncritical enthusiasts in our profession, who use every new drug that comes along, are using snake venoms on conditions it is not suited for and thus are bringing it into disrepute to a certain extent. It will be only after a great deal more carefully controlled work than has yet been done is carried out that we will be able to decide whether the most despised and feared of all creatures on the earth have in their bodies substances that are of real value to man in his everlasting attempt to combat the many diseases to which he is heir.

'Nought so vile that on earth doth live

But to the earth some special good doth give'.

## Special Article

### SOME COMMON CONDITIONS TREATED BY ULTRA-VIOLET RADIATIONS

By AUSTIN FURNISS, L.R.C.P., L.R.C.S., L.D.S., D.P.H.

In this paper I have chosen some diseases and conditions which can be greatly benefited by the use of ultra-violet light. In writing these notes I have dealt with each subject from three points of view, viz : (1) the rationale of the use of the ultra-violet rays; (2) the available authoritative literature on the subject; and (3) the technique in detail. The following ten conditions will now be dealt with: abscesses, adenitis, pruritus ani and vulvæ, common colds, sycosis, lupus erythematosus, pregnancy and lactation, herpes, alopecia and acne vulgaris.

#### *Abscesses*

A good deal of success is obtained in aborting the pathological process. If the case be treated early, before pus has formed, one strong local erythema reaction will usually be sufficient. When pus is forming, luminous heat therapy—using the Sollux lamp—may cause resolution and save incision. Technique: this varies according to whether the abscess is in the incipient stage, or whether it is established or chronic.

*Incipient abscess.*—The Kromayer lamp and suitable applicator—small, round—is used in contact with the centre of the lesion, giving a third degree erythema reaction. This is followed at once by distance irradiation through the Kromayer window, two or three inches away, on

an area about two inches in diameter, in order to sterilize follicles. This is repeated only on subsidence, if necessary.

*Established abscess.*—In this case a brisk hyperæmia is produced with the Sollux lamp, using a localizer to the point of tolerance, e.g., half an hour at six inches distance. This is repeated daily, or more often until resolution occurs.

*Chronic abscess.*—In the first case it is necessary to establish efficient drainage. When this is effected a second degree erythema dose is given through the Kromayer lamp window. This is repeated on subsidence until healing takes place. In all the above-mentioned cases concomitant therapy is necessary. Various tonic measures should be employed, including suberythema light baths with the mercury-vapour lamp. This is especially necessary in tuberculous cases. F. Kraft, O. Bernhard, H. Heusner and W. F. Castle have all reported on the above forms of treatment.

#### *Adenitis*

In a large proportion of cases of primary adenitis the glands decrease in size under ultra-violet radiation without other treatment. Irradiation is the method of choice in these conditions, and the glands are usually reduced to a size that does not cause any noticeable deformity. Ulcerated surfaces and deep-seated glands with sinuses may call for intense and protracted treatment; possibly surgical or x-ray treatment



in addition. Tuberculous adenitis is perhaps one of the most frequent manifestations of surgical tuberculosis, especially in the cervical region. General light baths are an absolute essential in the treatment of these cases, and in most of them local treatment directed to the diseased foci is also necessary. In watching these cases one is struck by the fact that some of the best results are achieved in the case of patients with multiple foci, and with a very bad general condition, where one would have thought that resistance could not easily be raised; some of these cases do better than the milder ones. The carbon arc, with its constant spectrum and richness in the violet and ultra-violet portions of the spectrum, fulfils best the conditions of solar radiation, most favourable for general light treatment in tuberculous conditions. Besides the various carbon arc lamps which are used the mercury-vapour lamps are also of great value. In a large light room there should be two, or preferably four, mercury-vapour lamps of the Jesionek type placed in the corners with the Sollux luminous heat lamp overhead, so that the room is filled with actinic rays. Adequate ventilation is necessary. In the space between the lamps, six to eight patients move about, and children can play. The baths start at three minutes, and so on up to thirty to forty minutes. Besides the general mercury-vapour baths, each patient receives special irradiation of the diseased glands with a lamp which has longer and more penetrating rays. For this purpose smaller arc lamps, tungsten, iron, etc., are very good.

There are three stages in these patients suffering from primary cervical tuberculosis. The first stage, with enlarged hard nodes and much thickening and fibrosis. The second stage comprises patients whose glands are approaching caseation. The third class are those where caseation has occurred and where sinuses may have formed.

*Technique.*—The first and second stages respond well to the general and local treatment mentioned. Locally they sometimes react with swelling and tenderness, and in a large percentage of cases the enlarged nodes either disappear or remain as tiny nodules. When using the mercury-vapour lamp for these cases, sub- to first degree erythema doses should be given, repeated every two or three days. This should be combined with general luminous heat. A number of cases need weekly or bi-weekly treatments by compression with the quartz applicator of the Kromayer lamp, giving a third degree erythema. Patients approaching the caseation stage may also recover without surgical interference, but often aspiration is needed, and local light therapy is given immediately after this to prevent sinus formation. Patients in the third stage with broken-down glands need three forms of treatment: (1) general light baths; (2) local irradiation of the diseased foci; (3) treatment of the sinus by the quartz applicator of the

Kromayer lamp. In some cases preparatory irradiation with infra-red light is an advantage and accelerates the drying-up process. It may be mentioned that a very extensive literature is available dealing with this subject. Dr. C. Lee Pattison, along with others, reports favourably on the treatment of tuberculosis of the cervical glands by ultra-violet light. He exposed large areas of the body to slight 'erythema-producing' doses of ultra-violet radiation twice weekly. Westminster 'long-flame' carbon arc lamps were used with Watson's 'C' cored carbon electrodes (30 milliamperes current). The majority of patients showed improved general health. The following is abstracted from one of his papers. 'Of 162 patients, 52 were very markedly improved, in fact in 30 cases no glands could be felt at the end of the period of treatment. In 19 instances some of the glands formed abscesses which resolved with aspiration. Eighty-seven patients were improved in general health and their glandular enlargement diminished. In 14 patients the glands were apparently enlarged, while in nine they became worse'. In non-tuberculous adenitis I reported 84.6 per cent cured. The number of cases treated was, however, small. The following table is an extract from a report by Dr. G. Lissant Cox:

At the Finsen Institute it was found that only 40 per cent of patients with tuberculous glands were cured by x-rays, whereas 98 per cent of the patients treated by ultra-violet radiation were cured, the average time taken to effect a cure being 4.8 months.

#### *Puritus ani and vulvae*

Before planning treatment for this condition the cause must be investigated and, if possible, removed. Common causes are: discharges from cervix or vagina, cystitis, urethritis and urinary infections from various sources; constipation, piles, and fissures; oxyuris or their ova; the exudation of mucus, leaking paraffin, or an attack of diarrhoea may start pruritus in an area which when scratched or rubbed develops quickly into an angry eczema. Of recent years a mycotic infection has become common. If this cause is not recognized and treated in the early stage, the entire region becomes secondarily infected; this is partly due to the scratching. There soon develops an angry dermatitis and weeping.

Ultra-violet radiation offers to the dermatologist one of the most valuable adjuvants in treating these conditions. L. F. R. Knuthsen and F. Howard Humphris state: 'It is an agent which eases the hyperæsthesia and allays the irritation, and has a definite curative influence; used with intelligence, it is incapable of producing any harmful effects. . . . As in many skin diseases, benefit is obtained if general irradiation be added to local treatment'. Ultra-violet radiation, as is well known, exerts a biological action in the region of the inter-epithelial

nerve-fibrils. Also, if the pruritus be caused by the *Staphylococcus albus*, *Streptococcus faecalis*, *Bacillus coli*, or such mycetes as the epidermophyton or trichophyton, then the lethal effect of radiation will quickly kill them.

**Technique.**—The patient should be carefully prepared for local treatment. The hairy parts should be shaved, and then thoroughly cleansed with soap and water and carefully dried. Crusts should be removed. The parts should be smoothed out, and held apart so that folds or deeper parts of the recesses may become exposed to the treatment. Drs. Knuthsen and Howard Humphris recommend the Kromayer lamp. The lamp may be used at a distance of a few inches with a four minutes' exposure, or it may be placed in contact with the skin, the duration of exposure varying inversely with the square of the distance. The patient should be warned that erythema may be severe, and that it may be advisable for her to remain in bed a day or two. The second application should take place as soon as the erythema has subsided, and the distance remaining the same, the time should be increased by one or two minutes, according to the measure of erythema produced. Using this method it is found that the intervals are as follows: four, three, three, four, seven, seven days; six to twelve treatments being usually sufficient to produce permanent relief. General body baths are given with the mercury vapour lamp two or three times a week.

Dr. Agnes Savill recommends for early cases of eczema of the anus and vulva a few doses of light two to five times a week. It aids progress remarkably. Using the mercury-vapour lamp, begin with a local dose of one minute, desisting if any erythema has been set up. It is of the utmost importance that all healthy skin around the area to be treated, including buttocks and thighs, is carefully shielded with tissue paper. In the case of thickened and swollen perianal ridges, the tungsten arc lamp focused on the part—5 amps., at nine to twelve inches, for three minutes—has a good effect. It may be employed throughout the course of treatment.

#### Common colds

Drs. G. H. Maughan and D. F. Smiley have published several reports on the control of common colds by ultra-violet rays. Records show that the peak of respiratory infections comes in the dark months of the year, when we have the least sunshine and when people are least exposed to ultra-violet rays. Contact with sunshine and open-air improves the vitality of the skin and makes it more capable of performing its many functions. Other factors which Maughan and Smiley mention that make infections in winter more frequent than in summer are: closer contact of individuals, poor ventilation, over-heated air, too dry an atmosphere and faulty diet due to lack of green vegetables and fresh fruit. In September 1930 they reported

on the prophylactic radiation of about 300 men who were exposed in a special form of 'solarium'. 'The results of the year's work indicate a reduction of 58.8 per cent in the number of colds among the irradiated cold-susceptible men as compared with the non-irradiated groups. In addition to the ultra-violet irradiations, the irradiated students were given alkaline powders containing equal parts of sodium bicarbonate and magnesium carbonate whenever any cold was reported. We believe that results for the year 1929-30 are comparable with those of our two other reports'. Dr. W. Annandale Troup reports: 'A general bodily ultra-violet radiation, just sufficient to produce a faint erythema, combined with local irradiation of the nostrils by means of quartz applicators, will almost always abort a cold in its early stages. The general irradiation enhances the bactericidal power of the blood, and the local infection is dealt with by the local bactericidal action of the ultra-violet rays. Only one or two treatments are necessary, usually only one'.

**Technique (acute colds).**—Using the Kromayer lamp, commence with a flat quartz applicator about two inches long and rounded at the end. This is inserted full length into the nostril (blue filter). Switch over to white light and slowly withdraw so that three to four minutes' irradiation has been given to the passage. Repeat in the other nostril.

This applicator is then replaced by one about four inches long, with flat sides and slightly curved at the end, so that it can be readily passed along the lower nasal passages. By gentle handling and accommodating to the curves of the lower nasal passages, this applicator can be easily passed almost into the nasopharynx. The naso-pharynx is irradiated for two to three minutes. Finally, with a short thick applicator a minute's irradiation is given to the back of the throat. These approximate times are stated for the Standard Kromayer lamp. Treatment as a general rule should not be repeated for at least four days.

Dealing with the treatment of 'colds' by the Super-Kromayer lamp, Dr. E. J. Deck states: 'should the acute condition persist after the first treatment, the irradiation may with advantage be repeated at the end of twenty-four hours, giving a short exposure of forty seconds. Should the catarrh still persist, the patient is probably a victim of a chronic nasal catarrh. In this condition it is best to let the acute symptoms subside, and then carry on with four or even seven-day intervals between treatments'.

**Technique for prophylaxis.**—Mercury-vapour lamp—preferably combined with Sollux lamp, to guard against chill. General body baths, sub- to first degree erythema doses, repeated once a week. The reader is referred to the work on 'Common Colds', by Sir Leonard Hill and M. Clement, published in 1929.

### *Sycosis*

In the early stages of this disease, ultra-violet radiation produces rapid clearance. Besides local treatment, general irradiation should always be given, because it is possible by this means to raise the resistance of the patient, especially when he is debilitated. Also treatment should continue for some weeks after the last lesion disappears, to obviate relapse.

*Technique.*—The Kromayer or mercury-vapour lamp should be applied locally to the lesion and to a small margin of normal skin. The hair should be cut very short before the irradiation. A vigorous third degree erythema reaction should be produced. This is repeated on subsidence, increasing the dose to repeat the reaction at each treatment. As before mentioned, continue the treatment after the condition has apparently cleared up. In the more resistant chronic types, heavier dosage and more patience are necessary; epilation may have to be effected by means of x-rays, and afterwards compression treatment with the water-cooled lamp is often beneficial. Schindler advocates painting the affected parts with a solution of 5 per cent silver nitrate in 70 per cent ethyl alcohol, and then applying local irradiation. C. Marchesini has reported very favourably on the treatment of this disease by ultra-violet radiation. Other authorities who have reported favourably are G. B. Dowling, F. H. Humphris, F. D. Howitt, R. Bernstein, F. Pakheiser and W. F. Casle.

### *Lupus erythematosus*

Good results are obtained in most cases from ultra-violet radiation provided that general light baths are given chief place in treatment. The baths may be given either by the mercury-vapour lamp or the tungsten arc, and should not be prolonged beyond a dozen treatments without the usual month's interval. A sub- to first degree erythema reaction is aimed at, to be repeated every second day. Local treatment with the Kromayer lamp is also important, and strong doses with compression should be given. F. Thederer recommends compression, using the blue filter, five to ten minutes. E. H. H. and W. K. Russell have often noticed after the reaction produced by the Kromayer lamp has subsided that the irradiated area is easily distinguishable from the adjacent untreated parts, because it is so much paler. Recovery is gradual, and the treatment must be continued for many weeks or months. Diathermic cauterization is sometimes useful in refractory cases. Authorities who have reported on the ultra-violet treatment of this disease are L. J. Carter, N. F. Rowstron, W. E. Montgomery, C. A. Simpson and the late Professor Kromayer.

### *Pregnancy and lactation*

Ultra-violet radiation is of great value in pregnancy and lactation. This aspect is worthy

of consideration of all interested in maternity and child welfare. Extensive observations have been made at several municipal clinics and many other places. A leading American authority reports: 'It has already been shown by Hart, Steenbock and Elvehjem in extensive work with mature lactating goats that excessive impoverishment of the mother's reserve of calcium salts during lactation can be prevented by radiant energy; suggesting the use of ultra-violet therapy in this type of deficiency in lactation and pregnancy. Attempts have been made to learn how radiant treatment will affect the quality of cow's milk. . . . The results point to an environmental factor transmitted by the cow to her offspring through the medium of her milk. It suggests that the high incidence of rickets in children during the late winter months is due to the mother not receiving enough ultra-violet rays either during pregnancy or while in lactation.'

Expectant women usually show four subnormal conditions, *viz*, first, hypocalcemia or a deficiency of calcium, due to the mother giving her own lime to build the baby's bony structures, and often shown in the mother by the development of dental caries; second, anæmia or low iron content of the blood, probably due to the giving to the child of her own iron; third, nervousness and neurasthenia due to a low phosphorus condition consequent on the drain and worry of pregnancy; fourth, a marked increased acidity, or hyperacidity. As A. J. M. Treacy briefly puts it—'a neuro-circulatory asthenia, with hyperacidity'.

It is known that ultra-violet radiation not only supplies the three elements—calcium, phosphorus and iron—but it also increases the quantity of these elements already present in the system; moreover, it stimulates to greater activity such amounts as are present. Ultra-violet radiation does not influence phosphorus and iron as greatly or as definitely as calcium, but we know that, whenever there exists a calcium deficiency, it is generally accompanied with a low phosphorus and iron content. All cases treated with ultra-violet radiation show a marked general improvement and lessened symptoms of malaise, fatigue and nervousness. Alfred J. M. Treacy of Mount Siani Hospital, Philadelphia, studied 100 cases of pregnancy over a period of years and reported as follows: 'Of them, 80 were multiparæ and 20 were primiparæ. Of these, 25 cases, group A, were studied, with no treatment given but ultra-violet ray treatment; the second 25 cases, group B, were given ultra-violet ray treatment, with marked alkalinization with citro-carbonate; the third 25 cases, group C, were given ultra-violet ray treatment and moderately calcinized with calcinates; the fourth 25 cases, group D, were given ultra-violet ray treatment with alkalinization and calcinization, *i.e.*, a combination of groups C and D . . .

In all these cases studied I found that the hæmoglobin was increased 10 to 15 per cent, as

was also the coagulation time favourably influenced, decreasing the clotting time from four to two minutes.

I also found that women that were not heretofore able to nurse their babies, or those who only had slight lactation, had a much fuller breast milk supply when given ultra-violet ray treatment, and all who received this sun-ray treatment went through their prenatal period with much more vigour, strength and well-being than in any of their former pregnancies; and those who received all three measures of alkalinization, calcinization and ultra-violet ray treatment were in better condition than any of the other groups. Every prenatal clinic caring for prenatal cases should be equipped with one or more ultra-violet ray lamps, in order to get its patients in the best possible condition generally, and to help supply the expectant mother with the chemical elements she is lacking or deficient in, thus supplying her deficiency of calcium, iron and phosphorus.

An experiment with a considerable number of nursing mothers was made at the Manchester Municipal Sun Clinic with very good results. The women were sent up from the welfare centres because their breast milk was failing and occasionally because they were debilitated. Drs. Chisholm and McKillon reported: 'In treating these women we looked for improvement in the general health. This alone, in so far as it made the women more fit to undertake maternal and housewifery duties, would justify treatment. But we were hoping also for improvement in the breast supply, or its preservation for some time when it seemed to be failing. Of the cases who persisted in treatment (fifty-three in number), all experienced general benefit. In eleven cases, however, no benefit, so far as breast milk was concerned, was obvious, although in two cases the mothers said they felt better for a time. Of the remaining thirty-six cases, all were successful in improving or retaining milk supply for prolonged periods.'

A controlled experiment was carried out by Dr. D. E. Bunbury at the Royal Free Hospital. According to the weighing scales, no very spectacular case for light treatment of nursing mothers was made out. But among the lessons the author learns from this experiment is that figures are not the only aim in medicine, since 'she has vividly in memory many despondent, dejected and debilitated mothers who, as a result of a carefully-planned individual course of treatment, have been able to return to their household duties with something of that intangible "tone" that no measurements and no statistics can set out graphically, but which can only be measured by the trained clinician in constant touch with the sick, or by a good mother'. Extracts can also be taken from the reports of medical officers of health. The M. O. H. of Manchester reported: 'Adults referred for treatment included nursing mothers whose breast milk was beginning to fail, and the results here were

found to be satisfactory in almost 50 per cent of the cases. Expectant mothers were also treated for various disorders arising from their condition. The results in practically all these cases were very satisfactory, a definite alteration in the condition of the patient being produced after a very short course of treatment.'

The M. O. H. of Bethnal Green also reported: 'Our mothers say that ultra-violet has helped to cure their nervous depression, and has made them feel stronger and healthier. Cases of failing breast milk through general ill health have so improved that they have maintained breast feeding throughout the whole nine months without recourse to any artificial substitute.'

Dr. Nancy Gibbs of the Cardiff health department reported on the treatment of expectant mothers by ray therapy. The main disability treated was excessive vomiting. She reported: 'Beneficial effects were soon apparent. Almost without exception, after three or four doses the patients were either not sick or only very slightly so, and they stated that they felt better. . . . It would be difficult to give an exact comparison between cases of excessive vomiting treated by irradiation and those not treated, but there appear to be three significant facts. In spite of the day and hour and position of the clinic being inconvenient, the majority of patients attend with regularity, and are loth to discontinue when told they have had a full course of treatment . . . .

Up to the present more work (treatment of nursing mothers) has been done in this connection elsewhere with nursing mothers than with expectant mothers, and it appears to be generally accepted that the quantity and quality of the milk are improved.'

It may be mentioned that other medical officers, those of Smethwick and Southport, have also reported favourably on the use of ultra-violet rays in maternity. To recapitulate: Ultra-violet treatment ensures that the newborn baby will be properly developed, and that the mother will go through pregnancy without loss of teeth, and that the kidneys, thyroid gland and other glands producing internal secretions will function properly. It will prevent the development of high blood-pressure and eclampsia. It ensures good development of the muscles, including heart and uterus; therefore she will have the necessary physical power to give birth satisfactorily to her baby. The tone of the abdominal muscles will be such that she will not develop a large abdomen following the birth. Resistance to infection will be raised, so that there is little danger of infection. The coagulation time of the blood approaches normal, so that there is little danger of hæmorrhage. The mother who has had plenty of ultra-violet light will have an abundance of health-nourishing milk, and will have no trouble in nursing her child. The child will start life with a stored-up amount of the products of light and is able to better resist disease.

*Technique for pregnancy.*—General irradiation with the mercury-vapour lamp, following the lines of a tonic course.

*Technique for lactation.*—General light baths with the mercury-vapour lamp, following the lines of a tonic course, or, alternatively, local irradiation with the same type of lamp on the breasts, protecting the nipples, second to third degree erythema, five minutes at thirty-two inches distance, repeated daily or every other day.

### Herpes

This condition yields to the influence of ultra-violet radiation with unfailing certainty. Herpes of the scalp, probably on account of the tightness of the tissues in this region, is more obstinate to deal with than herpes in other situations, and the post-neuralgic pain is more difficult to relieve. Post-herpetic neuralgia is not a usual sequel in cases treated by actinotherapy. Many observers have recorded good results in the treatment of herpes by artificial light. M. Weinbren reports: 'There is little doubt that ultra-violet treatment was of benefit in the nine cases I have treated. It would appear (1) that general ultra-violet treatment will not prevent the onset of herpes, nor will the pigmented skin prevent the appearance of vesicles or scarring; (2) local ultra-violet radiation will remove the vesicles and relieve the accompanying discomfort.'

*Technique.*—If the blebs are very irritable use the Sollux lamp (luminous heat irradiation), with red filter for its drying effect, before applying the ultra-violet rays. The Sollux lamp is applied for fifteen to thirty minutes at a distance of twenty inches. The mercury-vapour lamp is applied locally to the lesion, giving a heavy second degree erythema. This is repeated daily until the vesicles disappear. The Kromayer water-cooled lamp may be applied in contact, to produce a second to third degree erythema on all the vesicles. This is repeated at one to two days' intervals until irritation disappears. E. J. Deck treats these cases with the tungsten focal arc at a distance of about twenty to twenty-four inches with a moving lamp. A four minutes' exposure can be given to begin with and gradually increased to about eight minutes. Amongst the many other authorities who have reported favourably may be mentioned D. Vajano, Tar-chini, Jackson, M. Cipriani and A. Devois. One should mention that post-herpetic neuralgia should be treated with the Sollux lamp. The lamp, with localizer, is applied to the affected area at the shortest tolerable distance, giving a dose of ten to twenty minutes according to tolerance. The time is increased progressively to thirty minutes. Daily irradiation is given.

The technique adopted by Dr. C. J. White is as follows:—'The ultra-violet light is applied to the whole circumference of the trunk, beginning with two minutes to the front of the chest and abdomen, two minutes to the whole back,

and two minutes to each side with the respective arms raised. Repeat these manœuvres each day, increasing the time two minutes in each position daily. In the rare instance of zoster within the oral cavity, use in addition applicators directly to the intra-oral vesicles'. 'By the employment of this light we hasten the cure, reduce the accompanying (often acute) pain, and lessen the chances of the distressing post-zosteriform neuralgia which may endure for five years, more or less'. Lumbrozo and Perez have also found ultra-violet irradiation to be of great value in the treatment of this condition. Their method is to give daily exposures—up to the number of twelve. The duration of the exposures is two minutes at first, the time being increased by one minute each day. The lamp is used at a distance of 60 cm. They also find that the treatment causes rapid disappearance of pain and general discomfort.

### Alopecia

The general opinion is that this condition benefits by actinotherapy. The condition seems to be associated with causes both constitutional and local. On this assumption it becomes obvious that general as well as local treatment is necessary. The aim in local treatment is to stimulate the hair follicles to regrowth. Prognosis is best in recent cases, but age and long-standing disease are not contraindications. The scalp must be scrupulously cleansed before treatment. The aim of general treatment is to raise the resistance of the individual and to act as a tonic. It is accordingly given on the lines of a tonic course.

Before describing the technique, quotations of a few workers may be given: W. Knowsley Sibley reports: 'All forms of alopecia, both those of limited extent and those which have advanced to the totalis stage, are greatly benefited by ultra-violet rays'. Thedering writes: 'Loss of hair due to seborrhœa, fevers, or anæmia can also be favourably influenced by light treatment. Irradiation of the head at a distance of 30 cm. for one or two minutes at a time, once a week, not only cures the seborrhœa, but stimulates a new growth of hair. Even incipient baldness can be cured by this form of treatment. . . . Loss of hair, as a result of anæmia or after fevers, can, as a rule, be arrested and a new growth stimulated. In addition to local irradiation, general irradiation should be applied'. The Senior School Medical Officer at Nottingham reported: 'The x-ray treatment of scalp ringworm depends for its success on complete shedding of the hair. I have recently observed that in such cases the period of baldness can be very materially shortened by appropriate ultra-violet radiation, as the result of which vigorous growth is usually obtained.'

F. Nagelschmidt's excellent results in a series of 200 cases should be consulted. Finsen reported thirty-nine cases cured out of forty-nine treated with his lamp. McCormac stated that



he was able to cure five cases of several years' standing out of six treated.

*Technique.*—(Alopecia totalis).—A second to third degree erythema reaction is obtained on the affected areas. Nagelschmidt uses the Alpine sun lamp, twelve inches distance, giving a ten minutes' exposure. Other parts of the head (ears, neck, forehead, etc.) are screened from the rays, cotton-wool being recommended to prevent sharp demarcation. It is important to see that the rays fall at right angles on the area. Two or three exposures may be required. Pain or œdema should be allayed by cold compresses (resorcin, aluminium acetate, boric lotion, calamine lotion, etc.), or ointment ('Hanoviol', 2 per cent, salicylic ointment, zinc oxide, etc., etc.) may be applied. The reaction is repeated every two to three weeks, increasing the first exposures. The course is continued for two or three treatments after regrowth is thoroughly established, or it becomes evident that the follicles are dead.

*Technique.*—(Alopecia areata).—A second to third degree erythema reaction is obtained with the Kromayer water-cooled lamp or the ordinary mercury-vapour lamp on each bald spot, treated separately, including a margin up to half an inch. The healthy hair should be cut short, and in the case of women the hair has to be parted and retained in position during treatment. The intense reaction is repeated every two or three weeks. The regrowth of hair usually begins in from ten to twenty days after the commencement of actinic treatment. Fragile white lanugo hairs first cover the site of the lesion, and gradually more hairs appear, which in many cases are darker than the original growth. Hall states: 'When treating cases of alopecia, general irradiation is best avoided in most cases'.

#### *Acne vulgaris*

Ultra-violet radiation gives very good results in all forms of acne, although relapses sometimes occur, and certain forms require concomitant measures. It is essential to treat the patient for any underlying disorders, particularly anæmia or constipation, and prescribe an alkaline diet. Finsen stated, in the earliest results which he published, that he had cured by the

use of his lamp thirteen out of twenty-five cases which had resisted ordinary measures. Mild forms of acne respond very favourably to ultra-violet rays. Obstinate forms which have resisted ordinary treatment show marked improvement after the first few applications of ultra-violet light. When keloid formation or much induration is present, or when there is a tendency to relapse, conjoint x-ray therapy is also necessary. Sequeira has stated that in acne he has found that artificial sunlight treatment given to the whole body has proved of value, probably by improving the general health and possibly by increasing the hæmobactericidal power of the blood. Russell has found that the chest and back respond to treatment more quickly than the face; probably shaving may account for this, since the heads of pustules are incised by the razor blade, and the infection is thus spread.

*Technique.*—The mercury-vapour lamp is used, giving a second degree erythema dose, to produce desquamation on all the affected areas. On the face each profile is treated separately, and the whole forehead to the roots of the hair is exposed. The eyes must be kept closed, but need not be covered by goggles. It may be necessary to protect the ears. The second degree reaction is repeated, increasing the exposure as required, until the skin is quite clear. Resistant infiltrations may need local third degree reactions with the Kromayer water-cooled lamp and applicator in contact, repeated as needed. Much benefit can often be obtained if simultaneous irradiation or pre-irradiation with infra-red rays, such as from the Sollux lamp, 'open' or screened with a red filter, is used. Irradiations from this source are performed with the lamp as close to the patient as can be tolerated, and exposures should last for from one half to one hour, and be performed at daily or alternate daily intervals, until a response is shown. In pustular acne it is well to evacuate the pustules before irradiation, and cleanse with alcohol. Some authorities (W. K. Sibley, L. C. Donnelly and F. Thedering) recommend x-rays, in combination with ultra-violet radiation, for resistant nodules. An extensive literature is available regarding the treatment of this disease by ultra-violet light.

## Medical News

### TWENTY-FIFTH SESSION OF THE HEALTH COMMITTEE

The Health Committee of the League of Nations held its twenty-fifth session from 26th April to 1st May.

The health committee discussed and approved its next three-year programme. The last three-year programme expired at the end of 1936. The new programme is largely a continuation of the work already being done by the health organization. It is divided into two categories: permanent activities and those intended to deal with topical problems.

In the former category may be mentioned the work of the Epidemiological Intelligence Service, the Commission of Biological Standardization, Leprosy and Malaria, and the duties of the Health Organization under international conventions.

#### EPIDEMIOLOGICAL INTELLIGENCE SERVICE

The creation at Singapore in 1924 of the Eastern bureau with its network of weekly telegraphic and wireless communication with the ports and countries of the East, was an important step forward. Indeed it



may be said that to-day all ports of any importance on the eastern coast of Africa, the southern coast of Asia, Australasia and the western Pacific are in close contact with the Singapore bureau. The epidemiological bulletin of that bureau is broadcast weekly in code and daily in clear. Nine wireless stations send out free of charge these broadcast messages, which may be picked up not only by health administrations in Asia, Australasia and East Africa, but also by ships plying in the Pacific and Indian Oceans.

At Geneva, the epidemiological intelligence service compiles and publishes figures relating to communicable diseases, births and deaths, in all countries and territories of the world for which such data are available. These statistics, which relate to an aggregate population of roughly 1,436 millions (namely, 72 per cent of the world's population), are published in three periodicals:

(1) *The Weekly Epidemiological Record*, which was begun in 1925 and is primarily intended to supply sanitary administrations and port health authorities with the latest data regarding pestilential diseases and quarantine measures taken against them.

(2) *The Epidemiological Report of the Health Section*, first issued in 1922. As the field of action of the epidemiological intelligence service gradually extended, the statistical tables appearing in this periodical correspondingly increased and grew into their present standard form. As from 1929 detailed articles on selected communicable diseases replaced the short notes on current epidemics hitherto published. Early in 1937 certain changes were made in the presentation and dates of publication of this periodical; the most important feature is undoubtedly the monthly publication of recent figures, together with material for comparison drawn from the mass of statistical material accumulated during the service's fifteen years of activity. The epidemiological articles will in future appear in the *Health Organization's Bulletin*. Readers of the epidemiological report will henceforth receive them in the form of reprints. The programme for 1937 includes articles on Weil's disease, the prophylaxis of typhus fever and maternal morbidity and mortality.

(3) *The Annual Epidemiological Reports* reproduce the monthly statistical tables of the epidemiological reports in a concentrated form, after figures have been revised and corrected by the competent national authorities. Retrospective tables are also included giving the rates of birth, general mortality, infantile mortality and mortality due to the principal communicable diseases during the last twenty years in countries possessing reliable records of causes of death.

These activities will be maintained and developed in the future. In connection with public health statistics, the international list of the causes of death is being revised by a joint committee composed of six representatives of the International Institute of Statistics and six representatives of the League Health Organization. This work is necessary as part of the attempt to make national public health statistics internationally comparable. In this connection too, a medical and statistical study, begun in 1936, will be continued on so-called 'health indices'. The object is to find some way of recording in statistical form the state of public health in different countries by indices of 'vitality' (fertility, population) and of 'health' (mortality, morbidity, physical and mental defects). The indices are intended also to relate to the 'environment' (geographical, social and economic) and to the various branches of medical and sanitary activities.

The health committee in 1936 requested its members to collect information in their own countries regarding maternal mortality and maternal welfare. This material will form the basis of a double report, one part technical dealing with the organization of maternal welfare services, and the other medical and statistical dealing with maternal mortality and morbidity and their causes.

#### BIOLOGICAL STANDARDIZATION

Although the health committee has been engaged upon biological standardization ever since 1921, its

work in this field is far from being completed. With the advance of science new therapeutic agents gain acceptance and require to be assayed in terms of some common standard; moreover, certain of the standards already adopted may be open to improvement, whilst others, being of a composite nature, are liable to be replaced, sooner or later, by the active substance in pure form; finally, in the case of yet other standards, physical or chemical titration may be expected to oust the biological method of assay—possibly in the near future. These considerations must be borne in mind when an attempt is made to delimit the work of the Permanent Commission on Biological Standardization during the next three years.

The results achieved by this commission were reviewed by the inter-governmental conference which met at Geneva in October 1935. Being convinced of the value of such a periodical review, the conference recommended that similar meetings should be convened at intervals not exceeding three years.

If the experimental research work being done internationally under the auspices of the biological standardization commission is sufficiently advanced to warrant it, such a conference may be held in 1939.

Two of the recommendations adopted by the inter-governmental conference call for special attention, namely, that which advocates that the use of the international standards 'should be made effective by the competent authorities of all countries', and that which relates to the setting up of national centres to hold and distribute the international standards, since these were the two resolutions that were communicated to all governments by the secretary-general in February 1936.

Replies so far received indicate that 41 countries have adopted or are about to adopt the international standards recommended by the permanent commission on biological standardization and that 31 governments have created or are about to create national centres.

The task of the central institutes at Copenhagen and Hampstead will thus be simplified as they will henceforth only have to provide for the regular supply to national centres of the requisite stocks of international standards, instead of having, as in the past, to meet demands coming from various laboratories and factories in each country. An effort is now being made to complete this system by inducing those countries which have not yet done so to establish national centres.

It remains to be seen, however, how many of these centres will be in a position themselves to prepare national standards equivalent to the international ones, so as to enable the two central institutes to husband the supply of their own standard substances, which are sometimes prepared at great expense.

It would appear that for some drugs—digitalis, pituitary extract, arsphenamine—no insuperable difficulties will be encountered in preparing national standards. This is not the case, however, for the serological standards, and it is to be expected that the Copenhagen institute will, as in the past, have to supply international standard sera to the great majority of national centres, whose business it will be to preserve these under the requisite conditions of temperature, and distribute them in their own countries to suitable applicants.

In any case, the fact of the adoption of international standards by so many countries demonstrates that the initiative taken by the health organization has been both valuable and necessary. That this work of international scientific collaboration should be continued and extended will appear from the report which the health committee addressed to the council on the work of its twenty-fourth session in February 1937. The report declares that 'biological standardization is an essential function of the health organization, and the latter should have the necessary resources at its command to make provision for the practical work entailed'.

In the field of serology several questions have to be reviewed from both the therapeutic and the practical points of view.

The standardization of anti-anthrax serum, already examined in 1925, must be taken up again with the

collaboration of the institute at Budapest and Bucharest.

Similarly, the further study of the standardization of anti-swine-erysipelas serum is necessary since earlier comparative assays did not give sufficiently concordant results. This study will be entrusted to the veterinary institutes at Budapest, Cambridge, Stockholm and Zagreb.

Changes in the international standards for tuberculin and staphylococcus antitoxin likewise fall to be considered.

A new field recently explored is that of the anti-snake venom sera. The problem of their standardization is so wide and complicated that it appears wiser at present to limit the study to the anti-viper serum. A preliminary survey has shown that the antigenic properties of the venoms of the African and Asiatic vipers differ to such an extent that the standardization of their anti-sera would involve the establishment of a series of monovalent standards. It would thus appear preferable to limit the study to the European viper. The Copenhagen institute is in correspondence with the European laboratories producing anti-viper serum and is at present endeavouring to work out a method of standardization.

On the other hand, the question of the standardization of anti-cobra serum would seem less complicated, since the South African serum also protects against Indian cobra venom. It should therefore be possible to establish a uniform standard and to secure, to that end, the assistance of the institutes of Bandoeng, Bangkok, Bombay, Johannesburg and Saigon.

Pharmacological standards, as well as those for vitamins and sex hormones, are also matters that come within the next three-year programme of the biological standardization commission.

#### MALARIA

The malaria commission is to take in hand the preparations for an inter-governmental conference on quinine and kindred febrifuges, to be held not earlier than 1939. The question of holding such a conference has been under consideration since 1925. After collecting a considerable amount of documentary material on the quinine requirements of malaria countries and discussing the matter on several occasions, the health committee has now come to the conclusion that a conference of this kind seems not only advisable but necessary. The views of producers and consumers are often considerably at variance and the conference could contribute largely to clarifying the position, with corresponding advantage for malarious populations. In view, however, of the great advance in the production of synthetic drugs, it would be necessary for the conference to take up also the question of these substances. An agenda of the conference would then include generally the following problems: present production as compared with world requirements; cost of production and market prices; relative costs of a plan of co-ordinated measures of treatment and prevention by the administration of drugs, according to the substance employed; methods of distribution of the various substances.

The malaria commission will issue the fourth general report on the therapeutics of malaria based on research work conducted during the last few years under the auspices of the League Health Organization in Algeria, Italy, Malaya, Roumania and the U. S. S. R.

In view of the steady success of the international malaria courses held in Rome and annually at Singapore since 1934, the health committee considers it advisable to continue holding these courses for the next three years.

#### LEPROSY

In 1929-30 the leprosy commission's contribution to the world-wide campaign for the prevention of leprosy consisted of a survey carried out by its secretary in a large number of leprosy countries in both the old and the new worlds, the organization of the Bangkok conference (December 1930) and co-operation with the

conference organized in January 1931 at Manila by the Leonard Wood Memorial.

After these two conferences, which consolidated the results of years of striving for the introduction of more liberal preventive methods and more rational forms of treatment, the majority of leprologists considered that further progress in this field could only be brought about by new scientific discoveries. Thanks to the co-operation of laboratory and clinical workers, experimental research has made rapid progress in a variety of directions, including bacteriology, serology, biological chemistry and pharmacology. It was to encourage scientific research without losing sight of practical application that the international centre for research on leprosy was founded on 12th June, 1934, at Rio de Janeiro under the auspices of the League of Nations.

At the same time the activities of various important institutions for the study and prevention of leprosy were extended, e.g., the Leonard Wood Memorial, the British Empire Leprosy Relief Association, its largely autonomous branch known as the Indian Council, the International Leprosy Association.

All this has created a new situation. The leprosy commission of the league health organization has accordingly been requested in connection with the three-year programme to plan its method of action and its relations with the other institutions in the light of this new situation.

In this connection, it is proposed that the League should organize meetings of experts from these various institutions in conjunction with the leprosy commission, with the object of taking up questions *seriatim* so that the main effort could always be concentrated upon some matter of outstanding importance.

These meetings of experts may be expected to recommend questions of particular importance or even urgency to the attention of investigators. For such research the Rio Centre affords first-rate facilities, which make it possible for laboratory work, clinical work and epidemiological investigation to be carried on concurrently.

To European leprologists, whose opportunities for the observation of the disease are restricted, it offers the most accessible field for investigation, while from the point of view of available facilities it is second to none. To centres in other parts of the world (e.g., Bamako, Batavia, Calcutta, Quilon, and the Japanese centres) it offers great possibilities for the exchange of staff and material together with facilities for study in the South American continent. A leprology course might be organized at Rio on the model of the Singapore malariology course, with the co-operation of specialists from various leprosy countries to make it of really universal value.

**Rabies and cancer.**—Collecting and co-ordinating information on cancer and rabies are others of the permanent activities of the health organization which will be continued under the three-year programme.

**Opium and other dangerous drugs.**—The problem of narcotics first came before the health committee in 1931 when it was called upon to determine the legitimate requirements of these drugs in various countries. Having laid down the principle that the only legitimate requirements were those in respect of medical and scientific use, the committee, in the light of detailed investigations, fixed the maximum at 450 milligrams of opium and 7 milligrams of cocaine per head of population per year (1924) and this only for those countries with advanced medical organizations. These two figures have since been generally accepted, in particular at the international opium conference in 1925, as standards of legitimate consumption.

An analogous enquiry was undertaken in 1929 in order to determine the world requirements in narcotics with a view to facilitating the work of the conference on limitation, planned for 1931. These figures were fixed at 9,700 kilogrammes for morphine, 790 kilogrammes for diacetylmorphine and 6,000 kilogrammes for cocaine, and have successfully withstood the test of time.

After the ratification of the International Opium Convention of 1925, fresh responsibilities of permanent

character fell to the health committee. Under Article 8 of that convention the committee has since examined the proposals of 18 governments in regard to 290 preparations, 51 of which were considered to be innocuous and were excluded from the scope of the convention. Under Article 10 the health committee during the past ten years has recommended that the following substances should be brought under control:—

1. Dihydroxycodeinon
2. Dihydrocodeinon
3. Dihydromorphinon
4. Acetyldihydrocodeinon
5. Dihydromorphine
6. N-oxymorphine, N-oxymorphinic compounds and other morphinic compounds—(a azote pentavalent).
7. Esters of morphine and their salts.
8. Thebain and its salts.
9. Ether-oxydes of morphine and their salts, excluding methylmorphine and its salts and ethylmorphine and its salts.
10. Preparations containing any of the substances mentioned under 1 to 9 above.

All the above recommendations, which were made in agreement with the office international d'hygiène publique, were accepted by the states parties to the convention.

On the proposal of the United States government, the health committee will proceed—always conjointly with the office international d'hygiène publique—to study a new phenanthrene derivative of morphine, namely, desomorphine; without presenting any therapeutic advantages, this substance appears particularly harmful by reason of its toxicity and habit-forming properties.

As a result of the international conference for the suppression of opium smoking (Bangkok 1931), and on the invitation of the council, the health committee has undertaken the study of various methods of treatment of addicts in a number of European countries and in North America. Some twelve clinical reports have been collected from U. S. A., Great Britain, Canada, France, Germany, India and Netherlands East Indies and placed at the disposal of governments through the intermediary of the opium advisory committee.

In 1930, on the proposal of the government of the United Kingdom, the health committee was invited to have an efficacious method worked out for the determination of the morphine content of raw opium, with a view to this method being adopted for the practical control of the manufacture of morphine. After study extending over three years, an expert committee succeeded in establishing a procedure which is now known as the International Method. The committee is continuing its studies with a view to eliminating certain defects inherent in the method, and is at the same time examining a number of other methods, such as that used by the new American Pharmacopœia, by the Japanese Pharmacopœia, etc.

At the request of the Japanese government, the committee undertook in 1932 a similar study with reference to the cocaine content of coca-leaves. These investigations are well advanced and a final report should be presented to the health committee before the end of 1937.

In view of the numerous cases of codein-addiction observed in Canada and the United States during recent years, the governments of these two countries requested the health committee to examine this problem. A general report on the question was drawn up and submitted to learned societies in France, Great Britain, the Netherlands and Switzerland, for technical advice. As soon as this consultation is concluded, the documentation will be considered by the health committee and a report addressed to the council and to the two governments concerned.

#### RURAL HYGIENE

In view of the proven value of the European Rural Hygiene Conference, the Indian Delegation, supported

by that of China, proposed at the 1932 assembly that an inter-governmental conference\* on rural hygiene for Eastern countries should be convened as soon as circumstances permitted. The health committee having proposed that the conference should be held in Bandoeng in August 1937, in conformity with the kind invitation of the Netherlands government, the council in October 1935 accepted this suggestion. Preparation for this conference, at which all but three governments of Eastern countries will be represented, was entrusted to a commission of three members set up by a decision of the council (January 1936). This commission during the summer of 1936 visited India, Burma, Malaya, Siam, Indo-China, Philippines, the Dutch East Indies and Ceylon. Their report has already been communicated to the countries concerned.

The documentary material prepared for the conference includes national reports drawn up by the public health services of the participating countries and covering the various items on the agenda, namely:—

- I. Health and medical services.
- II. Rural reconstruction and collaboration of the population.
- III. Sanitation and sanitary engineering.
- IV. Nutrition.
- V. Measures for combating certain diseases in rural districts.

Most governments have already communicated the composition of their delegations, which comprise in most cases not only medical and health officers but also representatives of veterinary services, departments of sanitary engineering, agriculture and education.

*Housing.*—The studies carried out so far under the auspices of the health organization have shown that the problem of housing is not purely sanitary, social, hygienic, financial or architectural, but a combination of all these aspects. The last assembly, at the suggestion of the Swedish delegation, expressed the opinion that it would be advisable to extend the scope of the studies undertaken with a view to considering the various aspects of the problem as a whole; the assembly therefore requested the council to invite the Economic, Financial and Health Committees and the International Labour Office to establish suitable collaboration in order to present a general report to the next ordinary assembly.

*Physical fitness.*—This problem was first raised before the assembly in 1924 by the delegation of Paraguay. Two years later the Czechoslovakian delegation took similar action, and as a result the assembly decided to invite the health committee to include an international study of physical education in its programme of work.

The committee at that time, with a view to making in the first instance a survey of the problem submitted to it, entrusted Professor Piasecki of Poznan with the study of the physical education movement and the policy followed in this field by different countries. In his report Professor Piasecki first described the various national methods of physical education, then the training of instructors and finally discussed problems such as the psychological repercussions of physical exercise, their adaptation to individuals, comparative value, etc.

In 1931 a group of experts presided over by Dr. D. Ottolenghi of Bologna was consulted by the health committee as to a programme of international study and recommended *inter alia* that research should be made into the effect on the organic functions of muscular work, particularly that of a heavy and fatiguing kind. Experiments were carried out for two years (1932-33) by Professors Krogh, Lindhard and Christensen with three trained athletes who were subjected to muscular work prolonged to exhaustion point. Observations covered the thermo-regulation, the respiratory exchanges, influence of dietary, renal functions, and led to important conclusions in regard to the training of athletes.

With a view to bringing to a close this exploratory phase of study of a problem which was becoming of

\* This conference has taken place.—EDITOR, I. M. G.

increasing interest to public health services, as effecting the well-being and evolution of the population, a detailed memorandum was drawn up with the approval of the health committee's bureau (October 1935), concerning the problem of physical fitness considered from such aspects as physiological, pathological, psychological, educational, athletic and social. This report, compiled by Dr. C. Wroczyński under the title of 'Physical Fitness and Health', will be published shortly in the health organization's bulletin.

The health committee now considers that work in this field can only adequately be pursued by appointing a commission of physiologists to formulate the scientific bases of rational physical education, adapted to different areas. The international labour office has already constituted a committee of corresponding members on 'Workers' Spare Time', of which a section will examine physical fitness questions and the methods of collaboration between the office and the health organization in this field have been settled by mutual agreement.

**Nutrition.**—Since 1925 the health organization has been engaged in the study of nutrition in its relation to public health; the preceding health committee in 1934 included in its three-year programme the drafting of a general report on the problem of nutrition and entrusted this task to Drs. W. R. Aykroyd and Etienne Burnet. This report, intended primarily for public health administrations, defines the rôle of nutrition in public health and preventive medicine; it served as a basis for discussion when, at the sixteenth assembly, twelve delegations requested the inscription of this problem on the agenda.

On the proposal of the Australian delegate, the assembly recommended that the health organization should continue and develop its work on nutrition in collaboration with the technical organizations of the League, the international labour office and the international institute of agriculture; at the same time the assembly decided upon the creation of a mixed committee of experts in agriculture, economics and public health, with the mandate of presenting a general report to the next assembly on the problem of nutrition in its public health and economic aspects. The nineteenth international labour conference (1935) adopted a similar recommendation.

In October 1936 the health committee, having considered the Burnet-Aykroyd report, decided to set up a technical commission on nutrition. This commission, at its first session in London in November 1935, laid down the physiological bases of nutrition and established the food requirements of human beings during their growth, from conception until adult age. With a view to the application of the recommendations of the committee in different countries and their adaptation to varying geographic, economic and social conditions, the report was communicated to learned societies and social study institutions in various countries.

At its second session held in Geneva in June 1936, the technical commission examined the observations communicated by various bodies, and revised and amplified its London report in certain respects. This revised report was communicated to the mixed committee, in conformity with the assembly's resolution in 1935, and was included in that committee's report to the 1936 assembly.

The report of the technical commission recommended for further study a list of problems as follows:—

- (a) Assessment of the nutritional state of children.
- (b) Nutritive food requirements during the first year of life.
- (c) Minimum vitamin and mineral requirements.
- (d) Minimum fat requirements.
- (e) The nutritive and 'supplementary' values of the different protein-containing foods, to determine to what extent and in what forms animal protein is necessary for growth and health.
- (f) The relative nutritive value of different cereals according to the degree of milling.

- (g) The extent to which the increasing consumption of sugar is detrimental to health.
- (h) Influence of climate on food requirements.
- (i) The extent to which diets in common use fall below the standards recommended in this report.
- (j) The optimum amounts of milk required at different ages.

The study of questions (a) and (b) was considered by two consultations of physiologists and pediatricians (December 1936), representing the national agencies to whom the technical commission's report had been submitted.

As regards the methods of assessment of the nutritional state of children, the experts recommended different types of survey in accordance with the number of children to be examined. The first type is applicable to the state of nutrition of large groups of children; it is limited to a record of age, sex, physical appearance, weight and height. The second type of survey involves more extensive tests but applied to smaller groups of children. In addition to the tests under type 1, a thorough medical examination is recommended as well as an economic and social survey of the families and a study of the dietary of the child. The third type of enquiry, biotypological in character, aims at studying the disturbances affecting the human body owing to a quantitatively and qualitatively deficient diet. The latter type will include various somatometric and physiological measurements, bearing upon the different bodily functions, as well as blood and sensorial measurements and psychological tests.

Several of these different types of study are being carried out in Belgium, France and the Netherlands; others are contemplated in Sweden, Czechoslovakia and Austria and will deal with 50,000, 10,000 and 20,000 children respectively. Finally, surveys of the first and second types have been going on for some time in the United States, the United Kingdom, Poland and Norway.

A close study is being made of the food measurements during the first year of life. The problems involved have been submitted to the learned societies and scientific bodies in several countries, which, in some instances, have nominated special commissions or rapporteurs for the purpose.

Finally, a general study should be made of the problems under (h) and (i) in order to consider, on the one hand, the extent to which dietaries in common use fall below the standards recommended in the report of the technical commission, and, on the other, what are the differences observed as regards the state of nutrition of people in different countries or in different regions of the same country. Should such differences be found, it would be necessary to determine whether they are essentially due to the influence of climate.

It may be said without exaggeration that the work of the technical commission on nutrition has aroused the greatest interest both in the medical world and outside it. The commission's first report on the physiological bases of nutrition has created a considerable impression not only in Europe but also overseas. Thus, the agenda of the inter-governmental conference on rural hygiene in the Far East includes items inspired by the commission's report, such as the composition of dietaries, nutritive value of the principal foods, deficiency diseases, the method of their investigation having to be adapted to local contingencies. Likewise the commission's recommendations will be followed in the action following on the study made by Professors Dragoni and Burnet in 1935 in regard to popular nutrition in Chile; the report of these experts is now in the hands of the Chilean Government, and a condensed version of the document will be published in the next issue of the health organization's bulletin.

The procedure followed up to the present in the study of nutrition by the health organization has produced valuable results in a comparatively short space of time. Since, therefore, it has proved its worth, there

is no reason to modify it. Thus the technical commission will remain the pivot of all activity in this field. For specific studies it will, as in the past, have the benefit of the collaboration of groups of specialists or can apply for authoritative opinions to national authorities, leading scientific institutions, learned societies, institutes and schools of hygiene—the latter carrying out certain field studies on behalf of the commission.

LEAGUE OF NATIONS.  
Information Section.

#### XIV ALL-INDIA MEDICAL CONFERENCE MADRAS, 1937

The XIV All-India Medical Conference will be held this year in Madras during Xmas week.

This is the first time, after 13 years of existence of the Indian Medical Association, under whose auspices this conference is held annually, that Madras has made up its mind to invite the conference. The reception committee that has been constituted is thoroughly representative of all shades of medical opinion in this province. Funds are necessary and we hope there will be an overwhelming response to the general secretary's appeal.

#### AN ESSAY COMPETITION

1. A gold medal called the 'Rai Shambhu Dayal Sahib Gold Medal' will be presented for the best prize essay on a public health subject to be announced each year.

2. The subject of the next essay is 'A scheme for the improvement of the health of the school children and the sanitary condition of schools in the United Provinces'.

3. The competition will be open to the general public, including the medical and the public health workers in the United Provinces.

4. The essay is to be written in simple Hindi and should not exceed 3,000 words in length.

5. Essays should reach the medical officer in charge, Provincial Hygiene Institute, United Provinces, Lucknow, by 30th November, 1937.

6. The name and address of the competitor must be distinctly written on each essay submitted and the envelope should have the words 'Prize Essay' in the top left-hand corner.

7. The Director of Public Health, United Provinces, shall judge the merit of the essay and his decision with regard to the award of the medal shall be final.

8. No correspondence will be entered into on the subject of competition.

9. No essay will be returned.

#### THE FACULTY OF TROPICAL MEDICINE AND HYGIENE, BENGAL

The following students are declared to have passed the L.T.M. Examination, Session 1937.

*Passed*

(Arranged in alphabetical order)

1. Ujagar Singh Anand, L.S.M.F., acting medical officer, District Board Dispensary, Baragoah, Dist. Jhelum (Pb.).
2. Narayan Chandra Banerjee, L.M.F., private practitioner.
3. Ram Moy Banerjee, L.M.F., private practitioner.
4. Sudhir Kumar Banerjee, L.M.F., out-door officer, Mosquito Control Department, Corporation of Calcutta.
5. Narendra Nath Baral, L.M.F., private practitioner.
6. Nagendra Nath Bhattacharjee, L.M.P., private practitioner.

7. Guru Dass Bhattacharya, L.M.F., private practitioner.
8. Birendra Chandra Bhattacharya, L.M.F., private practitioner.
9. Satyendra Narayan Bose, L.M.F., private practitioner.
10. Lal Mohan Chakrabarty, L.M.F., private practitioner.
11. Hiron Kumar Chakraborty, L.M.F., private practitioner.
12. Jatindra Kumar Das, L.M.P., private practitioner.
13. Sudhir Kumar Dutta, L.M.F., malarialogist, Kapnapahar Laboratory at Kashinagar, Juri, Dist. Sylhet.
14. Wasudeo Yeshwant Gholap, L.M.P., private practitioner.
15. Bhupendra Nath Ghosh, L.M.F., private practitioner.
16. Sudhir Chandra Ghosh, L.M.F., honorary registrar, Campbell Hospital, Calcutta.
17. Gangadhar Vinayak Godbole, L.C.P.S., sub-assistant surgeon, in the Medical Department of the Tanganyika Territory Government, East Africa.
18. Amarendra Nath Halder, L.M.P., railway sub-assistant surgeon, Burma Railway.
19. Promode Ranjan Hazra, L.M.P., private practitioner.
20. Shripad Sadashiv Kale, L.M.P., private practitioner.
21. Sitaram Subrao Kulkarni, L.C.P. & S., private practitioner.
22. Kadatur Srinivasamoorthy Kuppu Rao, L.M.P., private practitioner.
23. Hari Mohan Lal, L.S.M.F., medical officer, Central Jail Hospital, Naini, Allahabad.
24. Md. Ahmed, L.M.P., officiating medical officer-in-charge, Leprosy Clinic, Bettiah Estate.
25. Kalkaprasad Jagannathprasad Mishra, L.C.P. & S., railway sub-assistant surgeon, B. B. and C. I. Railway, Idgah, Agra.
26. Mohammed Arfan Ali, L.M.F., sub-assistant surgeon, Government of Bengal.
27. Subodh Chandra Mukerji, L.S.M.F., private practitioner.
28. Dharendra Nath Mukhopadhyay, L.M.F., private practitioner.
29. Paerumbadari Madham Anantha Patter Narayanan, L.M.P., private practitioner.
30. Ravi Varma, L.S.M.F., private practitioner.
31. Barmeshwar Sahay, L.M.P., private practitioner.
32. Bhagwati Sahaya, L.M.P., L.P.H., medical officer, Provincial Subordinate Medical Service, U. P., In-charge, Bharthana Dispensary, Etawah.
33. Kamala Pati Sarkar, L.M.F., private practitioner.
34. Bibhuti Bhushan Sarker, L.M.F., private practitioner.
35. Nori Lakshmi Kanta Sastry, L.M.P., private practitioner.
36. Bimal Chandra Sen, L.M.F., private practitioner.
37. Pramatha Nath Sen, L.M.F., assistant medical officer, Guptipara Hospital, Hooghly.
38. Sidhabattula Kurma Row, L.M.P., railway sub-assistant surgeon, Bengal-Nagpur Railway.
39. Prem Narain Sharma, L.S.M.F., private practitioner.
40. Harisukh Parbhuram Shastri, L.C.P. & S., private practitioner.
41. Samarendra Nath Sinha, L.M.P., private practitioner.
42. Madhava Rao Sirsi, M.B.B.S., private practitioner.
43. (Mrs.) Rishi Devi Sondhi, L.S.M.F., In-charge of the Indian Army Child Welfare Centre, Jhelum.
44. Jagat Narain Srivastava, L.S.M.F., private practitioner.
45. Shambhoo Prasad Srivastava, L.S.M.F., private practitioner.
46. (Miss) Margaret Tason, L.S.M.F., In-charge of the State Female Hospital, Jodhpur.



## Current Topics

### The Use of 'Doryl' (Carbaminoylcholine) in Post-operative and Post-partum Retention of Urine

By CHASSAR MOIR, M.D., F.R.C.S. (Edin.), F.C.O.G.  
(From the *Lancet*, Vol. I, 30th January, 1937, p. 261)

THE nervous control of the bladder musculature and the processes involved in the act of micturition are extremely complicated and still only in part understood. It is certain, however, that much of the muscular activity of the bladder is under the control of the parasympathetic nervous system.

As the result of the investigations made during recent years by Dale and Loewi and their associates, it is now generally agreed that nerve impulse in the parasympathetic system is transmitted across synapse, and passed from nerve ending to muscle or gland by the momentary liberation of a chemical substance, acetylcholine, which is itself almost instantly destroyed by enzyme action. Acetylcholine can be prepared synthetically, and if administered in an appropriate manner it will reproduce the effects of parasympathetic stimulation. It has therefore been suggested that acetylcholine, or an allied substance, might be effective in promoting micturition in cases of post-operative retention of urine due to atony of the bladder wall or even to reflex spasm of the bladder sphincter.

Since acetylcholine is rapidly destroyed by enzyme action in body fluids, injection of even relatively large doses of this substance cannot be expected to produce more than a fleeting stimulation of the organs controlled by the parasympathetic nervous system. On the other hand, certain other choline esters have a pharmacological activity approaching that of acetylcholine while being, at the same time, much more resistant to enzyme action. One of these esters—carbaminoylcholine—has been issued to the medical profession under the trade name of doryl. Among its suggested therapeutic uses is the treatment of retention of urine, and Schulze has reported successful results in some 75 per cent of cases in which it was used after operation or after childbirth. The Therapeutic Trials Committee of the Medical Research Council agreed to accept doryl for further clinical trial in this way, and the manufacturers (Messrs. E. Merck of Darmstadt) have kindly supplied it for the purposes of the tests described below.

#### DOSAGE OF DORYL

Doryl is issued in tablet form for use by mouth, and also in ampoules containing 0.25 mg. of the pure substance (carbaminoylcholine) dissolved in 1 c.cm. of fluid; the solution is intended for hypodermic or intramuscular injection. In a few preliminary experiments oral administration of doryl proved ineffective in promoting micturition, and injection was therefore resorted to. In the cases to be reported a full ampoule was used, and the dose was usually given intramuscularly.

#### RESULTS IN CASES OF RETENTION OF URINE

In a preliminary series of some 10 cases of post-operative retention of urine, injection of doryl was found to be remarkably successful in causing the patient to void urine within a few minutes, thus obviating the necessity of catheterization. After this initial success, detailed records were kept of the effect of the drug in order to provide a report for the Therapeutic Trials Committee, and the present statistics refer to this later series of observations.

The patients were unselected and consecutive cases of retention of urine occurring in the gynaecological and obstetric wards of Hammersmith Hospital (British Postgraduate Medical School). All the cases were those showing evidence of bladder distension of such degree as would, in ordinary circumstances, necessitate the use

of a catheter. The total number of cases collected is comparatively small (38), but it is intended that the results should be considered in conjunction with the similar report by Mr. J. S. Maxwell, who tested the drug in the surgical unit of the Western General Hospital, Edinburgh. The case records have been divided into three groups—successes, partial successes, and failures. By a 'partial success' is meant that the patient voided urine after administration of doryl, but that subsequent evidence showed the bladder still to be incompletely emptied.

		Abdominal section	4
		Colporrhaphy	3
		Curettage	2
Successes	14	Attempted abortion: self-injury	1
		Post-partum	4
Partial successes	8	Colporrhaphy	1
		Post-partum	7
Failures	16	Colporrhaphy	3
		Bartholin gland excision	1
		Post-partum	12

In most of the cases one dose only of doryl was given, but in 5 the dose was repeated. Thus a patient who had voided urine satisfactorily after administration of doryl later had a recurrence of retention; this was again successfully treated by an injection of the drug. Similarly, 3 patients listed as partial successes had a recurrence of retention and were again given doryl (twice in one case); the results were again partial successes. One patient, who was suffering from over-distension of the bladder, and who had failed to respond to the drug, was not relieved by its repeated administration.

It was found that if doryl was to be effective, the patient usually felt a desire to micturate within 15 minutes of the injection. Sometimes the effect appeared in as short a time as 5 minutes, and for that reason it was found to be important to give the patient a bed-pan immediately after the administration of the drug. It is fairly certain that some of the early failures were due to a lack of appreciation of this fact—the urge to micturate being allowed to subside before the patient was given facilities to void urine.

#### COMMENTARY

Some of the successes were remarkable, and not infrequently the patient passed flatus or faeces in addition to voiding urine.

It will be seen that most of the failures were in cases of post-partum retention of urine. Some of the patients in this group were suffering from injury to the vulva or perineum following difficult forceps delivery, and the compression of the urethra caused by the subsequent oedema and muscular spasm possibly explains the non-success of the drug. It seems likely, however, that a more common reason for its failure was a delay in the use of the drug until the bladder had become seriously over-distended. It is remarkable how often a puerperal patient has a symptomless yet gross over-distension of the bladder. It is also not uncommon to find that after apparently normal micturition such a patient will have a residual bladder content of 15 oz. or more. In some of the failures with doryl subsequent catheterization showed that the bladder contained more than 30 oz. of fluid. This over-distension is regrettable, yet it is notorious how often such a condition of the bladder escapes detection during labour and in the puerperium. It is probable that had post-partum retention of urine been detected at an earlier stage the doryl treatment would have been considerably more successful.

As was to be expected, colpoperineorrhaphy caused in some cases a stubborn retention of urine; the mechanical procedures involved in this operation not infrequently produce a compression of the urethra which only catheterization can overcome.

#### SIDE-EFFECTS

The pulse rate was in each case taken before injection and again quarter of an hour after administration of



doryl. Usually it was unchanged. Sometimes it was slightly accelerated. In one case it dropped from 84 beats per minute to 60.

In 8 cases the patient complained of nausea or faintness, or admitted to having these symptoms after direct questioning. In one case the faintness was of some severity and led to anxiety on the part of the nursing staff; it lasted for a few minutes only. Another patient who felt nauseated, actually vomited some minutes after the injection. A few patients complained of salivation, and a few stated that they 'felt hot all over'.

In spite of the variety of possible side-effects, one is left with the impression that injection of doryl in the recommended dosage seldom causes more than a minor disturbance, and in this connection it must be remembered that there are many sensitive patients who are upset by the procedures involved in any hypodermic injection.

#### THE POSSIBLE EFFECT OF SUGGESTION

It may be questioned by some whether the successful results recorded in this paper were not in fact due to the effect of suggestion on susceptible patients, and were therefore unconnected with the specific action of the drug in reproducing the effects of parasympathetic stimulation. This criticism cannot be answered dogmatically, but there is reason to believe that suggestion is not the chief reason for the successful result of the treatment. All the patients on whom the drug was used had already resisted the simpler methods usually adopted by the nursing staff to encourage a patient to pass urine. Again, the bladder evacuation usually coincided in time with the appearance of the side-effects in those patients who showed such symptoms. Finally, the fact that a few patients not only micturated under the influence of doryl, but also evacuated a substantial part of the content of the colon and rectum, considerably strengthens the belief that the bladder effect is part of the specific pharmacological action of the drug.

#### SUMMARY

1. A series of 38 cases is reported in which post-operative or post-partum retention of urine was treated by injection of doryl (carbaminoylecholine).
2. Doryl is often remarkably successful in causing the patient to void urine naturally, and is worthy of trial in patients for whom catheterization would otherwise be necessary.
3. Its most successful use is after abdominal section or after a simple vaginal operation. It is least successful in patients suffering from over-distension of the bladder—especially after childbirth, and in cases in which there is mechanical obstruction to the passage of urine.
4. One of the chief errors to guard against is the assumption that a patient has completely emptied her bladder by the micturition induced by the drug. Often the evacuation is only partial.
5. Side-effects are seen in about a third of the cases, but are seldom serious.

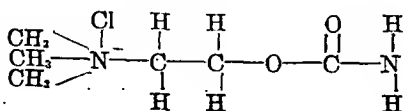
### The Treatment of Post-operative Retention of Urine with Doryl

By J. S. MAXWELL, M.B. (Edin.)

(From the *Lancet*, Vol. I, 30th January, 1937, p. 263)

In recent months all cases of post-operative retention of urine in the surgical wards at the Western General Hospital, Edinburgh, have been treated by injections of doryl solution.

The makers (Messrs. E. Merck of Darmstadt) state that doryl is carbaminoylecholine chloride, its formula being:—



Its actions are similar to those of acetylcholine, but it is much more stable, and is claimed to be effective even when given by mouth. It is issued as tablets containing 0.002 gramme doryl for oral administration, and as an isotonic solution in ampoules for injection; the dosage suggested for subcutaneous or intramuscular injection is 0.00025 g. doryl which is contained in 1 c.cm. of the solution.

Through its influence on the parasympathetic nervous system, doryl has been shown in pharmacological experiments to cause a decrease in heart-rate, a fall in blood pressure, dilatation of the peripheral blood-vessels, and contraction of the muscle of the bladder and intestinal tract. It is recommended by the manufacturers for the treatment of such diverse conditions as retention of urine, intestinal atony, hyperplasia, paroxysmal tachycardia, and eclampsia, but the present investigation is concerned only with its action on the bladder muscle. The antidote in cases of overdosage is atropine.

#### INCIDENCE OF POST-OPERATIVE RETENTION

During the time of the investigation 240 general surgical operations were performed at the hospital. Post-operative retention of urine developed in 17 cases, or 7 per cent. It did not occur in any patient below the age of twenty years; between the ages of twenty and eighty, the incidence was nearly uniform at all ages, but the 14 patients over the age of eighty escaped this symptom. The incidence in men was 7.7 per cent and in women 6.4 per cent.

Excision of hæmorrhoids was the operation most often followed by retention of urine; next came appendicectomy and other operations within the abdomen. In the 30 patients operated upon for radical cure of inguinal or femoral herniæ, there was no instance of post-operative retention of urine.

#### DOSAGE OF DORYL

If, 24 hours after operation, the patient was acutely distressed and could not pass urine, 1 c.cm. of doryl was injected subcutaneously. This dose was repeated at half-hour intervals until the retention was relieved or until a total of 3 c.cm. had been given. There was, however, no clear indication against reducing the interval between doses or of giving even more than 3 c.cm. (0.00075 g.) subcutaneously. Oral administration was not tried in this experiment.

#### RESULTS

Of the seventeen patients treated with doryl, eleven responded rapidly and passed urine within 5 to 25 minutes of the first injection. Four others required three injections each, passing urine within 15 to 30 minutes of the third dose. The remaining two patients failed to micturate within 30 minutes of the third injection, and might therefore be classed as 'failures'; both these, however, were relieved spontaneously within two hours. In the 'successful' cases in this series it appeared that doryl caused adequate emptying of the bladder, and in all but two of them micturition thereafter proceeded normally. Two patients had recurrences of retention, one on the second and third days after operation and the other only on the second day; the first of these had had an excision of hæmorrhoids, and the other an intra-abdominal operation; each recurrence of retention responded within 5 to 20 minutes to a single injection of 1 c.cm. doryl.

Operations liable to interfere mechanically with the urethra had been performed in five of the seventeen cases in this series (excision of hæmorrhoids in four and colpoperineorrhaphy in one); in all five of these cases the retention responded to a single injection of 1 c.cm. doryl, though in one, as mentioned above, it recurred on the two subsequent days. Since the use of doryl began, no case in these wards has been catheterized for post-operative retention of urine.

Three cases of acute retention due to prostatic enlargement also responded to doryl, though others failed to do so. It has been tried with success in retention due to periurethral abscess, pneumococcal

meningitis, and in a case of severe and chronic atonicity of the bladder and colon in a girl aged 23.

#### SIDE-EFFECTS

The most common side-effect was sweating. It was never very profuse. A few patients complained of nausea and a feeling of weakness. Sometimes the pulse rate was not affected, but more frequently there was a decrease of about 10 beats per minute fifteen minutes after injection. The systolic blood pressure also fell, 10 to 30 mm. Hg. fifteen minutes after injection. After one hour the blood pressure again became normal. Flatus was passed in many cases.

#### CONCLUSIONS

Doryl given by subcutaneous injection is a useful remedy for post-operative retention of urine. The results obtained in this series of cases appear to justify its trial in retention of urine due to any cause other than extreme mechanical obstruction.

I am grateful to Sir David Wilkie, director of the surgical unit, Western General Hospital, Edinburgh, for permission to publish an account of this study. I am also grateful to the manufacturers of doryl, who supplied the material through the Therapeutic Trials Committee.

### Blood Grouping and Compatibility: A Simple Technique for Determination from Small Amounts of Defibrinated whole Blood

By PAUL HOXWORTH, M.D.

and

AZEL AMES, M.D.

(Abstracted from the *Journal of the American Medical Association*, Vol. CVIII, 10th April, 1937, p. 1234)

In municipal hospitals heavily burdened with traumatic surgery, the method employed for grouping and matching blood prior to transfusion must be chosen for speed as well as for accuracy. While meeting modern requirements for safety, the technic will of necessity be designed primarily for efficiency. At the Cincinnati General Hospital, where more than 500 transfusions are given each year in the surgical service alone, there has been a gradual evolution towards a more efficient routine for the selection of donors from groups of unknown volunteers. The procedure that we now consider ideally suited to our needs is a combination of the Vincent open macroscopic method for grouping and the Coca compatibility test for direct matching. Each method has been slightly modified, so that both determinations may be made with a single small sample of defibrinated whole blood. The Vincent and the Coca methods were reported almost simultaneously in 1918. We know they were used in combination for many years by Coca and Grove at the New York Hospital prior to 1932, and perhaps others have employed both methods; but the advantages of their use in combination have never been emphasized, and the Coca compatibility test is known to very few.

Prior to 1918 the best methods for grouping and direct matching were those advocated by Minot. He pointed out the need for simple rapid methods, did away with the washing of cell suspensions, and encouraged elimination of the old hæmolysis tests established by Moss and Epstein and Ottenberg and later modified by Weil and by Rous and Turner. For blood grouping he advised the use of stock test serums and a simple citrated blood suspension (one drop of blood in 1 c.c. of a 1.5 per cent sodium citrate solution in saline solution) mixed in cover-slip preparations. For direct matching he advocated Weil's 1 : 9 and 9 : 1 mixtures of citrated whole blood set up in tubes but read microscopically in hanging drop cover-slip preparations. The contingencies of war led to the development of a rapid macroscopic agglutination test for blood groups by Vincent, who found that, by citrating stock test serums,

blood could be added directly from finger puncture to drops of serum on a slide.

In the hands of experienced technicians employing standardized high titted test serums, the Vincent method is now generally considered the safest as well as the simplest procedure for determining blood grouping. If the selection of donors could be rigidly restricted to a choice of individuals from the same blood group as the patient, no further test of compatibility would be required except as a check for possible errors in grouping and the exceptional occurrence of atypical agglutination. In emergencies, however, just as one must sometimes employ a donor without knowledge of his Wassermann reaction, relying on an examination for primary and secondary lesions, so must one also at times make use of a 'universal' donor or, more rarely, in the case of a 'universal' recipient, a donor from group A or B. Under these circumstances a compatibility test is imperative, for it is well known that group O donors frequently possess agglutinins of a titre dangerous for A or B recipients, even in the proportions of a small transfusion. Furthermore, compatibility must be determined quantitatively as well as qualitatively by some method that will reproduce as faithfully as possible *in vitro* the conditions (whole blood) and proportions of the proposed transfusion *in vivo*. Therefore it is quite essential in hospitals of this type that the method employed for direct matching be designed not only for checking grouping errors and atypical agglutination but also for actual slide titration of the donor's agglutinins against a proper proportion of the patient's blood. Coca's method, simplifying the older methods of Weil, and of Rous and Turner, and modified by Levine and Mabee and Landsteiner, admirably fulfils these requirements.

#### TECHNIQUE

Approximately ten drops of blood are obtained by finger puncture and defibrinated in a Wassermann tube by whipping with a wooden applicator for five minutes. This quantity is sufficient for grouping and several compatibility tests. Separation of cells and serum is not desirable.

**Grouping.**—Large drops of high titted test serums anti-B and anti-A are placed on the left and right ends respectively of a glass slide. Defibrinated blood is added to each drop of serum and thoroughly mixed with the aid of a platinum loop. The slide is tilted back and forth over a white background in bright light and observed macroscopically for clumping. Agglutination is striking and, if serum of grade I Coca is used, will be complete in less than one minute. When no agglutination is seen after one minute on either side, the slide is placed under a petri dish with wet blotting paper and, observed again fifteen minutes later as a precaution against weak agglutinogens.

**Matching.**—A 1 : 1 or 50 per cent suspension of the recipient's defibrinated blood is prepared in the stem of a white blood cell counting pipette by drawing blood up to the 0.5 mark and then filling to the 1.0 mark

*Comparison of agglutinin titre of serums used at Cincinnati General Hospital with grade I (Coca) serum*

Serum	Serum dilution	Cell dilution	Macroscopic agglutination time
Grade I (Coca)	1-4	1-4	11 seconds
Serum at Cincinnati General Hospital	Anti-A 1-10	1-4	5 "
	Anti-B 1-10	1-4	5 "

with physiologic solution of sodium chloride. The blood is diluted 1 : 1 with saline solution because agglutination cannot be differentiated microscopically in any greater

concentration and because dilution inhibits undesirable rouleau formation. The diluted blood is deposited on the left end of a glass slide and mixed by means of a jet of air blown from the pipette. An identically prepared suspension of donor's defibrinated blood is placed on the right end of the same slide, and one-fifth of this drop (two divisions of the pipette) is transferred to the drop of diluted recipient's blood. This 1 : 5 ratio is based on the assumption that 500 c.c. is to be transfused to a patient whose blood volume is depleted 50 per cent or approximately to 2,500 c.c. It provides a wide margin of safety in transfusions from a 'universal' donor, as dangerously potent agglutinins will not be completely absorbed in this concentration without manifest agglutination. The 1 : 5 mixture of donor's and recipient's blood is then stirred with a platinum loop or glass rod, and the slide is placed under an inverted petri dish with a piece of wet blotting paper. After fifteen minutes the mixture is again agitated and observed microscopically under low power for agglutination.

Care must be taken not to confuse rouleau formation with agglutination. The former can always be broken up by stirring, while the latter will be intensified. Agglutination will be striking if a grouping error has been made, but a little practice is required to estimate the degree of agglutination of the recipient's cells by a 'universal' donor's agglutinins, in the presence of nonagglutinable cells forming rouleaux. Unless the agglutination is so definite and conspicuous that there is no question of confusion with rouleaux formation, the blood may be pronounced compatible.

#### DATA

The importance of employing reliable standardized high titted test serums cannot be over-emphasized. Open macroscopic grouping methods require an abundant supply of such serums. Before undertaking experiments with the Vincent method, we prepared large quantities of anti-B and anti-A serum from the blood of two volunteers possessing unusually high agglutination power as determined by slide titration of agglutinins. These serums excelled the requirements of Coca's grade I for commercial test serums, as shown in the accompanying table, without any artificial concentration such as the alternate freezing and thawing proposed by Terry.

For many years we had used home-made or commercial serums of indifferent quality, relying on cross-matching for safety, and employed a modification of Minot's method for grouping. Blood was obtained by venipuncture and three drops were mixed with a test-tube full of saline solution to make an unclotted cell suspension. The remainder was allowed to clot and was then centrifugated to separate the serum. Agglutination was determined microscopically in petrolatum-rimmed cover-slip preparations of cell suspension mixed with test serum and allowed to stand for from twenty to thirty minutes. For direct matching we had always used Moss's method simplified by elimination of citrating and washing of the cells. Reciprocal hanging drop preparations of equal parts of serum and saline cell suspension were observed microscopically after mechanical shaking for from thirty to sixty minutes.

In order to prove the greater efficiency and reliability claimed for the combined Vincent and Coca procedures, all groupings and matchings for transfusions given in the surgical service during a period of two months were determined both by the older methods and by our new Vincent-Coca technique. These examinations were made in parallel series on more than 200 consecutive specimens of blood. In each instance the new technique was tried first and then checked by the older methods. Not only was each pair of readings in agreement but in every instance the criteria of agglutination were more promptly and clearly defined with the Vincent-Coca procedure. The group could be determined by the open macroscopic method in a total elapsed time of from two or three minutes, and the interval of fifteen minutes prescribed for observation of the compatibility

test proved more than ample, as in no case did agglutination appear after five minutes that had not already occurred. 'Universal' donors with agglutinin titre potentially dangerous for A or B recipients could be detected by agglutination in the 1 : 5 mixture of donor's and recipient's blood, and many times we were able to employ emergency 'universal' donors with perfect safety. Occasionally 'universal' donors were used two or three times for one patient without ill effect. By virtue of the same quantitative feature, low titted A donors and occasionally B donors were safely selected for 'universal' recipients. On completion of these studies we abandoned the old modified Moss and Minot methods and adopted the combined Vincent-Coca technique as a routine. Over a period of nine months blood has been grouped and matched by this method for more than 400 consecutive transfusions without a single reaction due to incompatibility.

#### SUMMARY AND CONCLUSIONS

This technique combines the principles of the Vincent open macroscopic method for blood grouping and the Coca compatibility test for direct matching.

The advantages of these methods in general, and the combined technique in particular, may be summarized as follows:—

1. Both grouping and compatibility may be determined with approximately ten drops of defibrinated whole blood obtained by finger puncture.

2. Venipuncture and separation of cells and serum are unnecessary. This is particularly advantageous when donors must be selected in emergencies from large groups of unknown volunteers, as it saves the time required for preparation of needles and syringes, suspensions and serum.

3. The veins of patients requiring repeated intravenous therapy may be conserved.

4. Provided standardized, high titted test serums are employed, the blood group is usually obvious in less than one minute.

5. Compatibility may be determined with a wide margin of safety in fifteen minutes, and the conditions and proportions of the proposed transfusion may be duplicated beforehand *in vitro*, both qualitatively and quantitatively.

6. The time and material consumed in making cover-slip preparations are saved.

7. 'Universal' donors with agglutinin titre dangerous for A or B recipients can be detected by the 1 : 5 mixture of donor's and recipient's blood.

8. Low titted A donors may be selected for 'universal' recipients.

9. The total elapsed time from the arrival of unknown donors to the final reading of the compatibility test has been reduced to thirty minutes, and often the blood may be drawn in twenty minutes pending the final reading.

#### The Development of Acute Hæmolytic Anemia During the Administration of Sulfanilamide (Para-Aminobenzenesulfonamide)

By A. M. HARVEY, M.D.

and

C. A. JANEWAY, M.D.

(Abstracted from the *Journal of the American Medical Association*, Vol. CIX, 3rd July, 1937, p. 12)

THE use of sulfanilamide (para-aminobenzenesulfonamide) in the treatment of various bacterial infections, notably those caused by the hæmolytic streptococcus, is rapidly becoming widespread owing to the favourable reports published. Certain minor toxic effects of the drug have been noted; namely, a depression of liver function as determined by the bromsulfalein excretion test, fever, cyanosis and mild acidosis; but thus far no toxic effects of alarming proportions have been described in the literature. That a drug with such close chemical

relationship to aniline might have a very serious effect on the blood and bone marrow has undoubtedly been in the minds of many, and in this clinic patients have been rather carefully watched for the appearance of such phenomena. During five months of intensive use of sulfanilamide in the treatment of streptococcal infections nothing untoward occurred, and, until the cases of hæmolytic anæmia to be reported here were observed, this new drug, potentially so toxic, seemed to be a relatively innocuous therapeutic agent as far as the patient was concerned.

However, within a few weeks three cases of severe hæmolytic anæmia were observed in the wards of the Johns Hopkins Hospital, two occurring during the treatment of streptococcal sore throat and one during the treatment of meningococcal meningitis with sulfanilamide. So far we have not been able to prove conclusively that the drug was responsible for the rapid hæmolysis, but since no previous cases have been noted in this hospital with similar infections and a fourth case of hæmolytic anæmia has occurred in this city during the administration of sulfanilamide it seems fairly certain that the drug in some manner was responsible for the hæmolytic crises. We feel that it is most important that these cases be reported so that physicians using sulfanilamide in the treatment of seriously ill patients may be on the lookout for such a dangerous complication.

#### REPORT OF CASES

*Case 1.*—A Negro chauffeur, aged 36, admitted to the Johns Hopkins Hospital, 15th March, 1937, complained of an acute follicular tonsillitis. In general his health had been good in the past. He had typhoid at the age of 6 years and in 1922 a peritonsillar abscess, which was incised. Since childhood he had had frequent mild sore throats of from two to three days' duration, the last of which was one year before his present illness. Two days before entry he caught a head cold. The following day he noted a scratchy sensation in the throat and he had a slight chill. The sore throat grew worse and he came to the hospital for treatment.

The temperature was 104°F., pulse 110, and respiratory rate 40 per minute. The patient did not look severely ill. The general physical examination revealed very few abnormalities. The mucous membranes were of good colour, and cyanosis or jaundice was not noted. The tonsils were enlarged and red and were covered with flecks of yellowish exudate. A few tender glands were palpable at the angles of the mandible. The heart was not enlarged. A soft systolic murmur was audible over the whole precordium. The lungs were clear to percussion and auscultation. The liver and spleen were not palpable. The patient weighed 68 kg. (150 pounds).

The laboratory examinations revealed the following: Urine: specific gravity, 1.003; albumin, sugar, diacetic acetone and bile negative; urobilin 3 plus; sediment normal. Blood: red blood cells 4,900,000, hæmoglobin 101 per cent, white blood cells 19,000, of which 82 per cent were adult polymorphonuclears, 3 per cent juvenile neutrophils, 10 per cent lymphocytes and 5 per cent monocytes.

In the smear the red blood cells were normal in size, shape and hæmoglobin content. The platelets were numerous. There was no sickling of the red cells immediately or after twenty-four hours.

The Wassermann reaction was negative.

The throat culture showed 95 per cent beta hæmolytic streptococci.

The patient was given 4.8 gm. of sulfanilamide by mouth, and at the end of four hours the concentration of the drug in the blood was 10 mg. per hundred cubic centimetres. For the next two days the dose of sulfanilamide was 0.9 gm. every four hours, and after this the amount was lowered to 0.6 gm. every four hours.

The throat infection cleared up rapidly, and the temperature and white blood cell count dropped to normal on the third day of his hospital stay. During this period he complained of dizziness and nausea, and it was noted that his lips were slightly blue. On the fifth day of sulfanilamide medication, after two days

without fever, a temperature of 102.6°F. developed. It was thought that this was due to the drug, which was promptly discontinued. The following day he complained of severe headache and was quite drowsy and weak. He perspired continually, and the mucous membranes were discovered to be very pale and definitely icteric. An examination of the blood revealed at this time a red blood cell count of 1,570,000 with only 30 per cent hæmoglobin. There was a marked leukocytosis with 87,000 white blood cells, of which 1 per cent was myeloblasts, 20 per cent juvenile neutrophils, 53 per cent polymorphonuclear neutrophils, 2 per cent eosinophils, 14 per cent lymphocytes and 7 per cent monocytes. The smear showed numerous nucleated red blood cells, much polychromatophilia, and reticulocytes of 20 per cent. Platelets were very numerous. The urine contained large amounts of urobilin but no bile or hæmoglobin. The fragility of the red blood cells was normal. In spite of the jaundiced appearance of the patient the van den Bergh reaction of the blood showed only a slight trace of bilirubin. The non-protein nitrogen was 32. A bromsulphalein test of liver function resulted in 30 per cent retention of the dye thirty minutes after injection. A chenolsulfonphthalein test of kidney function showed 50 per cent excretion in fifteen minutes and 77 per cent at the end of two hours.

The patient was given three transfusions of citrated blood of 500 c.c. each during the next forty-eight hours, and his condition improved rapidly. The hæmoglobin and red blood cell count increased rapidly, and the marked evidences of regeneration of the erythrocytes, as revealed by the many reticulocytes and nucleated red cells, gradually subsided. The striking leukocytosis fell slowly to a normal count, and mature cells soon replaced the young forms.

During the recovery period he had an exacerbation of the streptococcal sore throat, which caused no apparent delay in the return of the blood picture to normal.

*Case 2.*—A Negress, aged 26, a housewife, entered the Johns Hopkins Hospital, 24th March, 1937, for treatment of a peritonsillar abscess. Her past health had always been good. In 1933 she had a severe sore throat with marked swelling of the tonsillar lymph nodes. She had recovered within a few days and remained in good health until December 1936, when a similar difficulty developed, which was less severe in nature.

Four days before her admission the throat became sore and she was unable to swallow solid food. Two days later the pain was so great that liquids could not be taken, and she finally came to the hospital for treatment.

The temperature was 104°F., the pulse rate 120 and the respiratory rate 28 per minute. The patient was acutely ill. She could only partially open her mouth, and talking was extremely painful. The skin was warm and moist. The mucous membranes were of good colour, and no cyanosis or jaundice was noticed. The right side of the face over the region of the mandible was swollen, rather indurated and quite tender. The right tonsillar gland was quite large, firm and tender. Above the tonsil on the right was a large, fluctuant, tender swelling, which displaced the uvula to the opposite side of the throat. The heart was normal, and the lungs were clear to percussion and auscultation. The liver and spleen were not palpable. The remainder of the physical examination showed no abnormalities. The patient weighed 51 kg. (122 pounds).

Laboratory examinations revealed the following: Urine: specific gravity 1.030, sugar negative, albumin 2 plus, acetone and urobilin positive, sediment normal. Blood: red blood cells 4,250,000, hæmoglobin 70 per cent, white blood cells 20,400. Differential count: juvenile neutrophils 15 per cent, adult polymorphonuclear leukocytes 70 per cent, lymphocytes 13 per cent, monocytes 2 per cent. There was no sickling of the red blood cells immediately or at the end of twenty-four hours. The platelets were normal and no parasites were seen. Slight anisocytosis was present. The Wassermann reaction was negative. A throat culture

showed 50 per cent beta hæmolytic streptococci. The blood culture was sterile.

The diagnosis was peritonsillar abscess, and it was decided to try the effect of sulfanilamide medication before incising the area. Because of the patient's inability to swallow she was given 4.1 gm. of sulfanilamide subcutaneously in 450 c.c. of physiologic solution of sodium chloride. The following morning the blood concentration of the drug was found to be 9.8 mg. per hundred cubic centimetres. The patient's condition was not improved, so that the abscess was opened and a large quantity of pus was removed. After this she received 0.6 gm. of sulfanilamide every four hours by mouth for four doses.

Thirty-six hours after the sulfanilamide had been administered subcutaneously the patient was found to be irrational and very drowsy. The mucous membranes were pale and definitely icteric. Examination of the blood confirmed the opinion that the patient had a severe hæmolytic anemia. The hæmoglobin had dropped to 39 per cent with an erythrocyte count of 2,250,000. The white cells now numbered 30,000, of which 9 per cent were myelocytes, 18 per cent juvenile neutrophils, 65 per cent adult polymorphonuclears, 5 per cent lymphocytes and 3 per cent monocytes. In the blood smear an occasional myeloblast was found and numerous nucleated red blood cells were present. The platelets were abundant. The reticulocyte count was 2 per cent. The clotting time and fragility of the red blood cells were normal, and the Donath-Landsteiner test was negative. Within the next twelve hours, before a transfusion was given, the hæmoglobin dropped to 18 per cent and the red blood cells to 2,000,000. The icterus index of the blood was 20 and the blood bilirubin was 2.0 mg. per hundred cubic centimetres. Large amounts of bile and urobilin were present in the urine, but no hæmoglobin was detected. The blood para-aminobenzenesulfonamide concentration was now 6.6 mg. per hundred cubic centimetres. A bromsulfalein test of liver function showed 28 per cent retention of the dye thirty minutes after the injection of 5 mg. per kilogram of body-weight.

During the next twenty-four hours the patient was given two transfusions of citrated blood of 500 c.c. each. The following day she was still listless and weak but was quite oriented. The liver was felt just below the costal margin, but the spleen was not palpable. The hæmoglobin had risen to 48 per cent. The white cell count was 14,200, and large numbers of immature cells were still present in the smear. Numerous nucleated red blood cells were seen, and the reticulocyte count was 3.6 per cent.

The patient continued to improve, the weakness and jaundice disappeared, and the throat healed rapidly. Nine days after the development of the hæmolytic crisis the hæmoglobin had risen to 55 per cent with a red blood cell count of 2,580,000. The white cell count was 8,900, the smear showed many immature white cells, and there was marked evidence of red blood cell regeneration as evidenced by a reticulocyte count of 12.5 per cent. All the bromsulfalein was excreted within thirty minutes after injection.

The sulfanilamide determinations of the blood were made by the method of Marshall, Emerson and Cutting through the courtesy of Dr. Marshall and Miss Margaret Strauss.

**Case 3.**—A white baby girl, aged 10 months, was admitted to the Harriet Lane Home of the Johns Hopkins Hospital, 6th April, 1937, because of fever, irritability and stiff neck for three days. The family history and the past history were non-contributory. The baby had always been healthy; she had a normal birth at full term and had developed normally.

Four days before admission the mother noticed that the child was less lively than usual. Three days before she had become restless and feverish and had vomited all her feeds. Two days previously a stiff neck developed; she refused nourishment and cried out whenever she was touched or moved. On the day before admission she seemed better but kept her head drawn

back. Finally her temperature rose again, her right eye became crossed and she was brought to the hospital.

The baby was acutely ill on examination. She was rather fat and flabby, with well-marked opisthotonos. The child lay quiet but cried out whenever she was disturbed. The temperature was 104.4°F., the pulse rate 170, and respirations were rapid and shallow. No skin eruption or jaundice was noted. The skin was warm and a little pale. The mucous membranes were of fair colour. The anterior fontanel was bulging and tense, the neck was rigid and the reflexes were jerky. Babinski's, Kernig's and Brudzinski's signs were not present. The eyes showed convergent internal strabismus, more marked on the right. The fundi were normal. There was congestion of the ear drums but no bulging, and the throat was normal in appearance. The heart, lungs and abdomen were normal. The baby weighed 9.5 kg.

Laboratory examinations revealed the following: Urine: orange, acid, no albumin nor sugar, sediment negative; urobilin not present in abnormal amounts. Blood: on admission, hæmoglobin 65 per cent, red blood cells 4,120,000, white blood cells 14,300 with 42 per cent adult and 18 per cent immature polymorphonuclears, 32 per cent lymphocytes and 8 per cent monocytes. The smear showed slight anisocytosis and polychromatophilia. The platelets appeared normal.

Lumbar puncture was done on admission; 20 c.c. of cloudy fluid were removed under rather low pressure. The Pandy test was strongly positive; sugar was negative. The cells numbered 11,400, almost all of which were polymorphonuclear cells. The smear was loaded with Gram-negative diplococci, which were mainly extracellular. Culture of both the blood and the spinal fluid showed meningococci.

On the basis of the clinical picture and laboratory examination a diagnosis of meningococcal meningitis was made, and the child was started on treatment with sulfanilamide. On the first day she was given a subcutaneous infusion containing 1.42 gm., followed later by another 1.5 gm. by the same route. For the next three days she was given a daily dose of 1.8 gm. subcutaneously and from 0.2 to 0.3 gm. intraspinally, making a total of approximately 2 gm. daily, or 0.2 gm. per kilogram of body-weight. Lumbar or cisternal punctures were done twice every twenty-four hours, and as much fluid as possible was drained off before sulfanilamide was administered.

The child remained critically ill for forty-eight hours with marked cyanosis, rapid pulse and shallow respiration, but during the third day her condition began to improve, and by the fifth day she was well enough to take almost all her food and fluid by mouth, and with it a daily dose of 2.8 gm. of powdered sulfanilamide. Her neck was no longer stiff at that time. Coincident with the clinical improvement, the spinal fluid began to clear, with a steady decrease in the number of cells to only 350 on the fifth day. It was noted that in the smear most of the organisms were extracellular on admission, but eight hours after treatment was started most of them were intracellular. Cultures, positive for meningococci at the first two punctures, became sterile after the first day.

On the seventh day her temperature, which had fallen to 100.8°F., rose again to 104°F. and the house officer was impressed by the marked discrepancy between the temperature chart and the patient's satisfactory condition, negative physical examination and normal spinal fluid. He noted an extreme pallor of the skin and mucous membranes and promptly made a complete blood examination, which showed a fall in hæmoglobin from 65 per cent to 40 per cent, a drop in the number of erythrocytes from 4,120,000 to 2,020,000 and a rise in white blood cells to 32,400. In the smear an abundance of immature polymorphonuclear leukocytes, nucleated red blood cells and reticulocytes was noted. The platelets appeared normal. The differential count revealed adult polymorphonuclears 35 per cent, immature polymorphonuclears 36 per cent (including 5 per cent juvenile cells and 4 per cent myelocytes), 25 per cent



lymphocytes, 1 per cent monocytes, 10 per cent nucleated red blood cells and 12 per cent reticulocytes.

A diagnosis of acute hæmolytic anæmia was made despite the absence of icterus or increased urobilinuria, and an increased urobilin excretion in the stools was found. The administration of sulfanilamide was stopped and the child was given transfusions of 90 c.c. and 50 c.c. of citrated blood on the seventh and eighth days, and on the ninth day of her illness the temperature came down to normal. At this point the child was eating well but seemed pale and weak. Blood counts on the tenth day showed hæmoglobin 70 per cent, red blood cells 3,690,000, white blood cells 11,200 with adult polymorphonuclears 36 per cent, stab forms 46 per cent (including 2 per cent juvenile cells), 12 per cent lymphocytes, 6 per cent monocytes, 0.5 per cent nucleated red blood cells and 6 per cent reticulocytes. Since then the child has continued to improve steadily.

#### COMMENT

Three instances of severe hæmolytic anæmia appeared during the course of infections which were treated with large doses of sulfanilamide (para-aminobenzenesulfonamide). That the drug was directly responsible for the development of these anæmias cannot be proved conclusively, but in view of the facts it is certainly a reasonable assumption.

Other conditions that produce an acute anæmia of this type have been fairly well ruled out. These patients were not suffering from hæmolytic jaundice, sickle cell anæmia or paroxysmal hæmoglobinuria. The clinical picture shows a striking resemblance to the cases of Lederer's anæmia that were reviewed by O'Donoghue and Witts. Only one instance of this type of acute hæmolytic crisis could be found in a search of the records of this hospital during recent years, and none has been observed during the course of a streptococcal sore throat.

When the patients were well enough for discharge, an attempt was made to reproduce the clinical picture in mild degree by the administration of a small dose of the drug. Patient 1 was given 0.9 gm. of sulfanilamide orally, and the blood concentration of sulfanilamide rose to 1.0 mg. per hundred cubic centimetres after five hours, while patient 2 received 0.5 gm. orally, with a blood level of 0.8 mg. per hundred cubic centimetres after four hours. Careful blood studies were made just before the dose, and four, fifteen, thirty, fifty and 120 hours afterward, while the excretion of urobilin was carefully followed in the urine and stool. At each examination of the blood the hæmatocrit and icterus index was determined, the reticulocytes and total leucocytes were counted, and stained smears were examined for changes in the red blood cells and platelets. No significant changes were noted in the blood, and the patients themselves had no symptoms, with the exception of slight nausea in one who knew what was being done. Quantitative determinations of urobilin excretion in the stool showed a definite rise from a daily average figure of from 50 mg. to 400 mg. in case 2.

This is rather difficult to evaluate, as there was considerable variation during the control period, and there was no evidence of increased hæmolysis in the blood examinations. It was not possible to keep these patients in the hospital for further study, nor was it felt justifiable to administer a much larger test dose.

Skin tests were performed on each of these patients, a mixture of sulfanilamide and normal human serum made up twenty-four hours before being used as the testing substance and equivalent mixtures of sulfanilamide with saline solution and serum with saline solution as controls. Each skin test dose of 0.2 c.c. given intradermally contained 0.05 c.c. of serum mixed with 0.15 c.c. of a 1 per cent solution and was therefore equivalent to 3 mg. of the drug. The patients were observed carefully for an hour and were examined again at twelve and twenty-four hours, but no positive reactions were obtained.

Sulfanilamide has been given to patients in similar amounts many times without any effect on the blood picture. Two of our patients were given an additional small dose of sulfanilamide without any reappearance of the peculiar blood picture. These facts lead one to believe that this is not a question of toxicity from overdosage or the type of drug idiosyncrasy that occurs in some cases after aminopyrine. The resemblance of these hæmolytic anæmias to the hæmolytic crisis produced by the use of phenylhydrazine is quite striking. It is possible that these individuals produce from the sulfanilamide a small amount of a toxic product having an action like phenylhydrazine or produce such a substance much more rapidly than the average patient.

It is essential to emphasize two important points in connection with these cases. First, whenever patients are being given large doses of the drug the blood picture must be carefully followed, especial attention being paid to the evidences of red blood cell destruction and regeneration such as reticulocytosis, the appearance of nucleated red blood cells and the presence of bile and urobilin in the urine, faeces or blood. Secondly, the anæmia was promptly improved, and the symptoms disappeared after transfusions of citrated blood in these cases. Thus the treatment of this type of anæmia is much more satisfactory than that of the aplastic type, which sometimes develops after the use of arsenical drugs.

#### SUMMARY

Three cases of acute hæmolytic anæmia developed during the course of infections being treated with large doses of sulfanilamide.

The blood of patients receiving large doses of the drug should be followed carefully for evidences of red blood cell destruction and regeneration.

In the three instances the patient recovered after the medication was stopped and transfusions of citrated blood were given.

Two of the patients were given a small dose of the drug after recovery with no change in the blood picture.

## Reviews

**PRACTICAL ENDOCRINOLOGY—SYMPTOMS AND TREATMENT.**—By Max A. Goldzieher, M.D. Second Edition. 1937. D. Appleton-Century Company, Incorporated, London and New York. Pp. xxiv plus 344. Illustrated. Price (not stated)

It is undisputed that endocrinology plays a very important part in clinical medicine in helping the diagnosis and treatment of many obscure cases. It is therefore gratifying to note that within the last few years great advance has been made in the development of the subject and the knowledge of its principles

has grown more and more and is now widespread among general practitioners. Even among those 'die-hard' conservative physicians who used always to be sceptical about its practical value and to look upon it as a modern fad, it has been a subject of increasing popularity. One can well understand the reason for the extreme scepticism that at one time prevailed as to the practical usefulness of the subject because it happened to be a highly technical one and it was largely the province of the specialist rather than the ordinary practitioner to bestow anything but cursory attention upon the subject.



In the present volume the author has attempted to present to his readers a survey of the symptoms which commonly occur in endocrine disorders and if these are properly observed and interpreted they are likely to lead to the diagnosis of the underlying glandular dysfunction. Successful treatment naturally depends primarily on correct diagnosis and hence this handbook of endocrinology, which is primarily written from a practical point of view, has much to commend it to the general practitioner.

We welcome the present volume not only because it can be classed as a textbook on the subject of endocrinology but because it is written in a clear, lucid and simple style so as to give as much information as may reasonably be required for the use of the general practitioner and student of medicine, and we recommend this book to them as such.

J. P. B.

**THE SURGERY OF THE SYMPATHETIC NERVOUS SYSTEM.**—By G. E. Gask, C.M.G., D.S.O., F.R.C.S. (Eng.), and J. Paterson Ross, M.S. (Lond.), F.R.C.S. (Eng.). Second Edition. 1937. Ballière, Tindall and Cox, London. Pp. xii plus 191. Illustrated. Price, 16s.

The second edition of Gask and Ross's 'Surgery of the Sympathetic Nervous System' is assured of a cordial reception. This edition has been carefully revised and numerous alterations have been made. But the most important new features are the sections on the clinical grading and prognosis of Raynaud's disease, on the recognition of localized structural disease of the main arteries, on afferent pathways in the sympathetic system, and on sympathectomy for dysphagia.

The authors have endeavoured to bring up to date the results of their own operations and to review the published results of other surgeons. It is once again emphasized that it was never the intention of the authors to compile a complete record of all the conditions which have been treated by sympathectomy. They are of opinion that the late result of sympathectomy is dependent mostly on the nature of the disease and not upon the powers of the sympathetic to regenerate, and of the viscera to function independently of their nerve supply.

This book consists of four chapters and 186 pages, and it is truly remarkable that within the compass of such a small volume, so much material of importance has been incorporated. The first chapter deals with anatomy and physiology and the description is very clear and succinct. In the next chapter the indications for sympathectomy in disorders of the circulation are fully considered. In chapter three, the disorders of the visceral motor mechanism of the alimentary and urinary tracts are discussed from the surgical point of view. The last chapter is assigned to the treatment of pain. The first part deals with visceral pain, *viz.* dysmenorrhoea, vesical and renal pain and angina pectoris. The second is devoted to the treatment of causalgia.

In spite of the great progress of surgery of the nervous system in recent years, we are obliged to confess that until more is known about the pathology of the sympathetic system, the place of surgery in the treatment of its disorders cannot be firmly established. Nevertheless, we have no hesitation in recommending this excellent book to the practising surgeon. The printing, get-up and illustrations are first-rate. There is also a useful index.

P. N. R.

**CLINICAL ALLERGY.**—By L. Tuft, M.D. 1937. W. B. Saunders Company, Philadelphia and London. Pp. 711. Illustrated. Price, 36s.

This is a very clearly written and full account of allergy, and it is quite up to date, an important matter in such a rapidly changing and expanding subject as the study of allergy has become.

There is rather a tendency for allergy to be divided into separate compartments depending on the site of the shock tissue. For example the dermatologist deals with skin allergy, the specialist in chest diseases with

asthma, and the nose and throat specialist with hay fever, and possibly the general physician treats cases with joint symptoms and other less clearly defined allergic states. Such a division is natural, but for a complete understanding of the subject all allergic manifestations must be studied and this book provides an excellent opportunity of doing so.

There are few criticisms to offer but we think for instance the author is rather dogmatic in stating that atopic dermatitis is not accompanied by vesiculation and oozing of serum. This does not conform with our experience in India. Apart from a few examples such as the above in which slight differences of opinion must arise as a matter of differences in individual experience and which do not detract from the value of the book, we have nothing but praise for this thorough and accurate presentation of a difficult subject.

The book is heavy for its size but it is bound with the flexible back which characterizes Saunders' publications so it can be handled away from a table without fear of damaging its binding.

P. A. M.

**A SYSTEM OF CLINICAL MEDICINE: DEALING WITH THE DIAGNOSIS, PROGNOSIS, AND TREATMENT OF DISEASE FOR STUDENTS AND PRACTITIONERS.**—By Thomas Dexon Savill, M.D. Edited by Agnes Savill, M.D., and E. C. Warner, M.D., F.R.C.P. Tenth Edition. 1936. Edward Arnold and Company, London. Pp. xxviii plus 1114 with 174 illustrations and six coloured plates. Price, 28s.

As a textbook of clinical medicine the popularity of this book is well deserved and is reflected in the production of the tenth edition within three years of its predecessor. The general arrangement follows the plan adopted by Dr. Savill in the first edition which appeared in 1905. The method of approach is from the point of view of symptomatology, a method which has undoubtedly been responsible for the reputation of this book as a textbook of medicine. The present edition has been thoroughly revised and recent advances both in medicine and laboratory methods of diagnosis have been incorporated. New sections dealing with newly discovered diseases and methods of diagnosis have been introduced in this book. In this task the editors had the help of seventeen collaborators who have been responsible for the revision of their own particular sections with the result that this edition contains all the latest information in every branch of clinical medicine. We have no doubt that this edition will maintain the popularity of Savill's medicine.

C. L. P.

**CLINICAL PARASITOLOGY.**—By C. F. Craig, M.D., M.A. (Hon.), F.A.C.S., F.A.C.P., Col. U. S. Army (Retired), D.S.M., and E. C. Faust, M.A., Ph.D. 1937. Lea and Febiger, Philadelphia (Washington Square). Pp. 733. Illustrated with 243 engravings. Price, \$8.50.

This book is written by two well-known parasitologists, one a protozoologist and the other a helminthologist, both of whom have already contributed valuable books to the literature of their special subjects as well as many papers and monographs. In the section on entomology they have been assisted by experts in this division of parasitology.

If one has any serious criticism to offer it is in the title of the book. To the reviewer it appears to be more a book describing the parasites of man in considerable detail with brief notes appended on description of the diseases caused by the various parasites, together with their treatment, but this latter portion is too condensed in many instances to enable the tyro to carry out the advice given. To give an example; spleen or liver puncture is advised in the diagnosis of kala-azar but there is no information how they are to be done. These are simple and safe operations if properly carried out but unless certain precautions are observed they may lead to serious consequences. If the authors did not have room to give this necessary information one

would expect to find an easily traced reference as to where it can be found. If there is a reference to this operation in the book it is not obvious for the reviewer could not find it. In the same disease it is surprising to find the name of Napier is not mentioned at all in connection with treatment.

Certain advice lacks the stamp of practical experience as when it is advised to keep the patient in bed on the morning of hookworm treatment. One cannot help visualizing the state of affairs on a tea garden if the medical officer carried out this instruction with several hundred coolies.

This is a good book as a guide but that is all it is. This is not directly the fault of the authors except in that they have attempted the impossible in trying to compress the necessary information regarding parasites, the diseases they cause and the treatment of these diseases into 656 pages. The idea of combining descriptions of parasites with the clinical and therapeutic considerations, and thus to give the reader a comprehensive view of the subject in one volume, is an excellent one. It has been tried before by other authors but none have fully succeeded so far, nor will they until a much bigger volume, or perhaps two volumes are devoted to the subject. Condensation is a laudable action as it lessens the time needed to acquire knowledge on a subject as well as to lower the cost of a book, but it may easily be carried beyond the point of utility.

As far as it goes this book can be taken as a reliable and quite up-to-date account of parasitology as it affects the human race and as such will prove a useful reference book. It would be improved by a fuller bibliography and a short section on spirochetes.

The volume is attractively bound and well printed, and as far as we could see is free from errors either by authors or printers.

P. A. M.

**THE ENDOCRINES IN OBSTETRICS AND GYNÆCOLOGY.**—By Raphael Kurzrok, M.D., Ph.D. 1937. Baillière, Tindall and Cox, London. Pp. xvi plus 488. Illustrated. Price, 34s.

In these days of rapid advance of practical medicine much attention is being given to the study of different diseases, more particularly the problems of obstetrics and gynaecology from the point of view of internal secretions, and many a dark corner in the field of clinical diagnosis has been illuminated by the application of the results of investigation into the functions of the endocrine glands. It is no wonder, therefore, that a practising physician should be considered as being not up to date if he lacks knowledge of this most important branch of physiology.

We welcome the publication of this book which deals with the entire field of organotherapy, more particularly in its relation to obstetrics and gynaecology in a very practical and thorough manner. The important clinical observations and deductions made in the present volume are the results of the author's laborious and intensive study and research work extending over a period of ten years and should prove very valuable not only to obstetricians and gynaecologists but to internists and general practitioners as well.

The book gives a fairly exhaustive account of the scientific foundation on which our present knowledge of endocrinology is built up. The addition of a bibliography at the end of every chapter is very welcome because it serves as a guide to those who wish to amplify their knowledge on the subject. We have no hesitation in saying that the book is a valuable contribution to our knowledge and should prove to be a standard work of reference on the subject.

J. P. B.

**PEDIATRIC DIETETICS.**—By N. Thomas Saxl, M.D., F.A.C.P., F.A.A.P. 1937. Henry Kimpton (263, High Holborn, W.C.), London. Pp. 565. Illustrated with 57 engravings and 2 coloured plates. Price, 32s.

Diet therapy for children is one of the most important measures at the command of the pediatrician and, in

certain diseases, is the only means of treatment. This book provides an adequate account of feeding, healthy and sick infants. Various diseases of children have been briefly described with directions regarding diet in treatment which form the main feature of the book. Besides, special diets, such as ketogenic, Gerson's, etc., have been given in detail.

The volume has been divided into three parts. Part I deals with the physiology and digestion and various foodstuffs with their composition and practical application. Part II deals with infant feeding and maternal nursing together with foods and proprietary preparations designed for infant use. Part III comprises short descriptions of various diseases with special reference to their dietetic management. There is an appendix at the end of the book which includes tables, recipes, practical suggestions and bibliographies. In places, however, the book seems to have exceeded the limit of its scope, for instance, even the conditions in which splenectomy is performed have been mentioned.

The volume is replete with excellent illustrations, two being full-page colour plates. It is however surprising to see the photograph of a grown-up girl with a wedding ring (figure 40) apparently as illustrative of juvenile pellagrins.

Numerous menus have been suggested for various conditions, but in most of them neither the quantity nor the caloric values have been mentioned. The diets recommended are not suitable for Indian children. One cannot order fried liver and bacon with apples for a child's supper in this country.

Though specially mentioned in the preface that repetition has as far as possible been avoided, one can not overlook 'infantile eczema' described under two sections.

Thrush and sprue have been considered as the same disease. The author maintains that the chemical nature of vitamin B is still unknown.

Otherwise, the book is a useful contribution to pediatric dietetics and will be helpful to those interested in the management of children.

R. C.

**THE AVITAMINOSES: THE CHEMICAL, CLINICAL AND PATHOLOGICAL ASPECTS OF THE VITAMIN DEFICIENCY DISEASES.**—By W. H. Eddy, Ph.D., and G. Dalldorf, M.D. 1937. Baillière, Tindall and Cox, London. Pp. ix plus 338, with 29 plates. Price, 20s.

This is a useful summary of our knowledge on the effects of vitamin deficiency in diet and it also gives a concise clinical account of the chief diseases produced by absence of the various vitamins from the diet.

It is essentially a book for the practitioner and as such is strongly recommended to the practising physician who desires to have a working knowledge of this comparatively new branch of medicine.

Unfortunately in many places careless construction of the sentences makes it difficult to extract the meaning the authors wish to convey and we were several times jarred by encountering unnecessary split infinitives.

P. A. M.

**A HANDBOOK OF LABORATORY MEDICINE: BLOOD.**—By D. Govinda Reddy, M.D. 1937. Printed by G. S. Press, Mount Road, Madras. Pp. 160. Illustrated. Price, Rs. 2-4. (Copies can be had from the Printers, G. S. Press, Mount Road, Madras)

This, as the author states in the preface, is a compilation and it is a very useful one for it gives all the essential methods for blood examination both from the point of view of the blood *per se* as in the anæmias or for any pathological changes or parasites it may contain as the result of disease.

It is also useful for a clinical or other laboratory worker to have at his hand information on the various standards of the blood contents and this book supplies them all.

The price is also within the scope of all, and we have pleasure in recommending this small book as a useful guide for clinical work.

P. A. M.

**COMPLEMENT OR ALEXIN.**—By T. W. B. Osborn. 1937. Oxford University Press, London. Humphrey Milford. Pp. xi plus 116. Price, 7s. 6d. Obtainable from Oxford University Press, Bombay and Calcutta

IN this monograph the author has given an interesting review of the extensive and scattered literature on the physico-chemical properties and the composition of complement. This is, as far as we are aware, the first book of its kind and will serve not only to give a clear understanding of this subject, which there has been a tendency to regard as mysterious but something of purely academic interest, and it will undoubtedly stimulate research. The subject-matter is divided into nine convenient chapters with a useful summary at the end of each chapter and a comprehensive bibliography at the end of the book. On the last page there is an excellent summary and discussion of the whole problem. The importance of the whole subject is well brought out in the concluding paragraph in which the author states that there is a tremendous literature regarding the blood in various pathological conditions. Much of it is contradictory and scarcely any of the work has been done under properly controlled conditions. The bactericidal complement and its near relative, the thermolabile part of the opsonin, being the factors actually responsible for the removal of foreign cells, have an importance in infectious diseases which is too obvious to need discussion. Yet, in our present ignorance regarding the nature, origin, and behaviour of complement, the study of complement variations in pathological conditions (with a few exceptions) has failed to be of much assistance in the diagnosis, prognosis and treatment of bacterial diseases. This is a book which will appeal to bacteriologists and post-graduate students.

C. L. P.

**BLOOD CULTURES AND THEIR SIGNIFICANCE.**—By Hildred M. Butler, B.Sc. 1937. J. and A. Churchill Limited, London. Pp. xiv plus 327, with 3 illustrations. Price, 15s.

THE isolation of the causative organism from the blood for diagnostic purposes in bacterial infections of the blood is seldom attempted by practitioners. The physician is often satisfied with the clinical diagnosis, or relegates the condition to that group of fevers known as pyrexias of unknown origin without making any effort to determine the real nature of the disease. This is due to several causes. Admittedly the majority of the practitioners of medicine in India do not possess the facilities of having a bacteriological examination of the blood of their patients made or have to be satisfied with the results of a single 'Widal reaction'. But even when facilities are available the clinician hesitates to have a blood culture made on his patients. This is due mainly to two causes, one the failure on the part of the clinician to have the blood examined at that stage of the disease which would yield the greatest percentage of positive results and the other the failure on the part of the laboratory worker to employ adequate methods, with the result that the clinician receives a very high percentage of negative reports. This has led to the neglect of a method of examination which not only gives direct evidence of infection but under certain conditions is of prognostic value.

The publication of this monograph, which is the third of a series from the Baker Institute of Medical Research, Melbourne, will do much to popularize this method of investigating disease and to bring about that necessary collaboration between the clinician and the laboratory worker. The author, Miss Hildred M. Butler, is to be congratulated on the production of this most valuable book. The scattered literature on blood culture has been collected and reviewed. The first two chapters deal with the general aspects of the subject and contain

full details of the methods and media found satisfactory by the author. The third chapter deals with the interpretation of positive and negative blood cultures. The rest of the book is devoted to the consideration of the nature, duration and significance of bacteraemia in various specific diseases and any modifications of the general technical methods or any special methods of cultivation required for any particular organism are fully discussed. There is a very useful bibliography at the end of each chapter. This is a book that will prove of great value to the clinician, the laboratory worker and to the patient, for its use will undoubtedly lead in many instances to a correct diagnosis.

C. L. P.

**FUNDAMENTALS OF BACTERIOLOGY.**—By Martin Frobisher, Jr., B.Sc., D.Sc., F.A.A.S. 1937. W. B. Saunders Company, Philadelphia and London. Pp. 474, with 230 illustrations. Price, 14s.

THIS is an interesting little book written in a style that makes pleasant reading. The subject is dealt with in a broad and general way. The book is neither exclusively medical, industrial, nor agricultural but is designed for those who seek to know something concerning the nature and behaviour of bacteria in general. A great deal of information has been collected together in this little book with the result that in some parts dealing with more highly specialized and technical aspects of bacteriology the subject is not dealt with in sufficient detail to be intelligible, except to those who are already familiar with the subject. In certain sections, as, for example, that dealing with agglutination reactions, the subject-matter has been so condensed that there is a danger of the student gathering an entirely wrong interpretation. The only other criticism that we have to offer is on the inclusion of a chapter on pathogenic protozoa in a book designed to stress the fundamentals of bacteriology. Although this is a book that is not suited to the needs of the medical student there is much in it that will be of interest to the medical practitioner.

C. L. P.

**THE LUNG.**—By W. S. Miller. 1937. Ballière, Tindall and Cox, London. Pp. xiv plus 209, with 152 illustrations. Price, 34s.

THIS brochure contains a little over 200 pages of text with numerous illustrations, some being coloured, and an index and a very full and authoritative bibliography at the end.

The whole book being the outcome of special researches under the skilful and experienced hand of the author contains much interesting matter not usually read in an ordinary textbook of anatomy. Indeed, with his keen insight, the author has seen the details of the pulmonary architecture in a way which has remained unexplored by many. His conclusions are drawn from well-designed experiments, and are thoroughly conclusive. The text is fully illustrated by plain and coloured diagrams. The chapters on air spaces and 'blood vessels' are illuminating and will be read with undoubted profit by those who are interested in the study of the anatomy of the lung and its diseases, and we think the same of the chapters on lymphatics and pulmonary lymphoid tissue. Figures 28 and 29 are fully explanatory and convincing of the descriptions of the air spaces. The same remark is applicable to figure 54 of the blood vessels.

An unique feature of the book will be seen in chapter XI, dealing with the history of the development of the knowledge of pulmonary anatomy, as sponsored by various authors from the early sixties.

The author has done a commendable work in unravelling the intricacies of pulmonary structure.

The paper, printing and illustrations are of high order, and the publishers deserve heartiest congratulations.

We are confident that the book will be a profitable addition to all medical libraries.

S. C. S.

**ANATOMY (BRAIN, SPINAL CORD, REGIONAL EMBRYOLOGY). CATECHISM SERIES. PART VII.** By C. R. Whittaker, F.R.C.S.E., F.R.S.E. E. and S. Livingstone, Edinburgh. Pp. 76. Price, 1s 6d. Postage, 2d.

THIS part completes the full set of the catechism series in anatomy and, as such, is written on lines similar to the preceding six companion parts. To encompass the complicated mass of facts of the nervous system and embryology, in the limits of a little over three score pages, in a comprehensive style, is in itself a task creditable to its author, and this he has achieved successfully.

This book presupposes that the student has read the usual textbooks and we are of opinion that to those who are now required to get a correct synopsis of anatomical facts in an answerable form as required in 'the viva', this little book will be a boon.

The subject being dealt with in the form of question and answer will be of help to the student during his anxious days before the examination, in the revision of the subject, in the minimum of time.

S. C. S.

**RECENT ADVANCES IN ORTHOPÆDIC SURGERY.—**By B. H. Burns, B.A., B.Ch., F.R.C.S., and V. H. Ellis, M.A., B.Ch., F.R.C.S. 1937. J. and A. Churchill Limited, London. Pp. viii plus 296, with 108 illustrations. Price, 15s.

ANY new addition to the famous 'Recent Advances' series is a matter of some importance in medical publication. This volume maintains the high standard of the series and the aim of supplementing rather than supplanting the textbook is admirably fulfilled. As in other numbers of the series the difficulty of determining what is and what is not a recent advance is overcome by a carefully selected reference to original papers in which the tale of progress may be amplified by the earnest reader. The opening chapters provide an excellent résumé of the chemistry of bone, the theory of bone growth, and the transplantation of bone, but it is disappointing to find the chapter on new growths of bone sketchy and restricted. American work on the subject of bone sarcoma may be regarded as a real advance, and more detailed treatment of the subject seems to be called for. The chapters on arthritis and tuberculous disease are full and clear and the account of internal derangements of the knee follows closely the teachings of English experts. Chapters XVI, XVII and XIX dealing with painful shoulders, disorders of the spine and low back pain are of exceptional interest and value and provide the careful diagnostician with much new material which has not yet found its way into general textbooks. The book is uniform in get-up with other numbers of the series and is cheap at 15 shillings.

H. R. R.

**ELEMENTS OF ORTHOPÆDIC SURGERY.—**By N. Ross Smith, M.B., Ch.M. (Sydney), F.R.C.S. (Eng.). 1937. John Wright and Sons, Limited, Bristol. Pp. xi plus 246. Illustrated. Price, 10s. 6d.

It is doubtful if the science of orthopædics is given the attention it merits in Indian schools. This little book with its exceptionally good illustrations, concise and dogmatic text, and precise practical directions deserves the attention of all newly qualified men in this country interested in surgery. Considering the small size of the volume, judicious selection has enabled the author to cover the essentials of the subject. The price is surprisingly high but in the reviewer's opinion the book is worth the money. A sound little treatise.

H. R. R.

**HEART FAILURE.—**By Arthur M. Fishberg, M.D. 1937. Henry Kimpton, London. Pp. 788. Illustrated with 25 engravings. Price, 40s.

THIS is a monograph on cardiac failure written from the point of view of anatomy, physiology and pathology and the knowledge from which has been applied

to the condition of circulatory failure. All the up-to-date scientific advances which have appeared as a result of research on the above basic subjects have been incorporated in the book in a manner which will no doubt appeal to practising physicians.

The book has been divided into thirty-seven chapters nearly half of which have been devoted specially to the consideration of the physiology and pathology of the heart and circulation and also other allied conditions. The next thirteen chapters deal with the various diseases of the heart and circulatory failure depending on such conditions. In the last six chapters, which have been reserved for the treatment of heart failure, both the general measures as well as the various drugs employed for this purpose have been discussed in detail. The consideration of digitalis occupies a specially big chapter which contains a large volume of useful and practical information. Each chapter is followed by a list of references which will be helpful to those who may be anxious to know more about the subject.

There are some features in the book which require criticism. Even a very casual survey of the book will convince one that it is too voluminous. Sacrifice of more than 300 pages for subjects which are only indirectly related to the main theme of the book cannot be justified. Instead of dealing with such matters only in so far as they are directly connected with circulatory failure the writer has gone to the length of discussing in detail their ætiology, pathogenesis, pathological physiology and anatomy, clinical picture and diagnosis—as if he is describing diseases entirely separate from the subject-matter of his book. This will undoubtedly tax the reader's patience and his capacity for reading. Another disappointment which comes to a reader is the very deceptive title of the book as he finds on perusal that it is not a monograph on circulatory failure but one on diseases of the heart and blood vessels and as such there is nothing new or original to deserve a special title. In the bibliography one can find any number of American and German references but just a sprinkling of British names although the British school of cardiology holds an important position in the world. Judging the book for what it is worth, the price of 40 shillings must be considered very high.

The book, though it cannot be recommended to students, on grounds of unwieldiness and high cost, is however a good one for practitioners, specially for purposes of reference.

M. D.

**HEALTH AND MUSCULAR HABITS.—**By Lieut.-Colonel J. K. McConnel, D.S.O., M.C., and F. W. W. Griffin, M.A., M.D., etc. 1937. J. and A. Churchill Limited, London. Pp. viii plus 159, with 27 illustrations. Price, 5s.

THERE now being a definite stir in the conscience of the nation in the matter of physical fitness, we welcome this little book. It draws attention to the need for corrective methods rather than muscular development. Normal movements of the body, faulty habits and their adjustment have been discussed in simple and non-technical language. One can easily learn these and help oneself with the aid of this book. There are twenty-seven diagrams which are very simple and clear. The book will appeal to those interested in physical education.

R. C.

**A GUIDE TO THE EXAMINATION OF CLINICAL MATERIALS.—**By Khagendra Nath Mitra, M.B., B.Sc., and Nabakumar Banerjee, M.Sc., M.R.A.S. Second Edition. 1937. Saizer and Company, Calcutta. Pp. 155.

THE present edition of this elementary book is a decided improvement upon the original one. It has been enlarged and the subject-matter revised and rearranged. Almost half of the book deals with 'urine' and the rest is devoted to the examination of various clinical materials, viz, blood, sputum, faeces, gastric contents, cerebro-spinal fluid and pus.

It is, however, unfortunate to note that the authors still adhere to the estimation of hæmoglobin by the old Tallqvist method. The improved techniques have been mentioned towards the end of the book but they advocate mixing of blood with water for the purpose. There are many important subjects that have been inadequately dealt with. For instance, fractional gastric analysis has not been mentioned and the descriptions of abnormal blood cells are too vague to be of any practical value. More attention ought to have been paid to the microscopical descriptions of common helminthic ova in the stools. Besides, there are instances of inaccurate information in the book. For example, a beginner will learn from it that yellow fever is caused by spirochaetes and that the Arneht count means division of all leucocytes into five classes. These, we hope, will be rectified in the next edition. The illustrations and get-up of the book are good.

R. C.

**THE ABDOMINAL SURGERY OF CHILDREN.**—By Sir Lancelot Barrington Ward, K.C.V.O., Ch.M., F.R.C.S. (Edin.), F.R.C.S. (Eng.). Second Edition. 1937. Oxford University Press, London. Humphrey Milford. Pp. xv plus 333. Illustrated. Price, 25s. Obtainable from Oxford University Press, Bombay and Calcutta

This is the second edition of a book first published nine years ago; it has been rendered necessary by the advances in surgery during this period. The book is up to date and is a model of sound surgery. It is well arranged and adequately illustrated, and two appendices, the one on anaesthesia by Dr. Niel McDonald, and the other on intravenous saline therapy by Mr. J. C. R. Hinderach, have been added. There is a short but adequate bibliography at the end of each chapter.

In the compass of only 316 pages the author has managed to say practically all that need be said of the common surgical afflictions of children and has discriminated nicely between the rare and the common diseases.

The book begins with a chapter on general principles which is particularly valuable. It is noted that the author is not enthusiastic about the treatment of imperfect descent of the testes by the injection of gonadotropic hormones involving as it does bi-weekly injections over a possibly long period and states that 'operation with 14 days' incapacity and little discomfort might be considered less of a trial of endurance'. He has so far been disappointed with pregnyl injections. As we do not yet know what other effects on the general body metabolism and on the testes themselves may be produced by the injection of such hormones, his conservative attitude is to be commended. In the absence

of symptoms, he waits until the age of 10 to 12 years before operating.

The book is obviously the work of a practical surgeon who in its preparation has brought to bear the fruit of his long experience at the Hospital for Sick Children, Great Ormond Street. It can be recommended with confidence to all surgeons, particularly in this country where specialization in the surgery of children has not been so highly developed as in western countries. The usual high standard of the Oxford Medical Publications is maintained and there are only a few errors.

F. A. B. S.

**THE PRACTITIONER'S LIBRARY OF MEDICINE AND SURGERY. VOLUME XII. PREVENTIVE MEDICINE AND HYGIENE. 1937. D. Appleton-Century Company, Incorporated, New York and London. Pp. xxxvii plus 993. Illustrated. To be completed in 12 volumes and general Index. Sold in complete sets only. Price, Rs. 485. Only available from Messrs. Butterworth and Company (India), Limited, Calcutta**

This is the last volume of a very important series, and perhaps in some ways it is the most important volume of that series. A first impression, from the title only, was that the scope of the volume was a little beyond that of the ordinary practitioner, but from experience of the past we should have had more faith in the general editor. Every chapter is one that will be of great value to the general practitioner, from the first two that deal with periodic health examinations to the last dozen or so that deal with the prevention of specific diseases, in various groups.

The chapter on the control of tuberculosis outlines a campaign to deal with this problem and emphasizes the part played by the practitioner in this scheme; the worker in India will get many valuable hints from this chapter. Early chapters discuss the hygiene of nutrition, of clothes, of exercise and rest, and of air and sunshine, sex hygiene, maternity and child hygiene, and personal mental hygiene. Sewage disposal and the protection of water supplies are naturally given due attention, and we notice that cholera is given as the best example of a water-borne disease, the classical Hamburg and Broad Street pump outbreaks being described in some detail.

Altogether this will form a very valuable book of reference for the practitioner when he is asked for his assistance in some social service scheme in his town or village, and it will also give him hints on personal conduct that he will find invaluable to himself as well as to his patients.

## Abstracts from Reports

**ANNUAL REPORT ON THE WORKING OF HOSPITALS AND DISPENSARIES UNDER THE GOVERNMENT OF BENGAL FOR THE YEAR 1935. BY MAJOR-GENERAL D. P. GOIL, K.H.P., M.B., Ch.B., F.R.C.S.E., I.M.S., SURGEON-GENERAL**

### CALCUTTA HOSPITALS AND DISPENSARIES

**Number of institutions.**—During the year only one new outdoor dispensary was added. Thus at the close of the year there were in all, 45 hospitals and dispensaries, of which 22 treated outpatients only, while the remaining 23 catered for indoor patients also. Besides there are several hospitals and dispensaries in Calcutta, maintained or aided by the Calcutta Corporation which, though doing very useful work, furnish no information of the same to the department. Arrangements have now been made for the requisite information

to be obtained and incorporated in this report in future years.

**Beds.**—The total number of beds in the Calcutta hospitals was 3,723 against 3,721 in the previous year.

The average occupation of beds during the year was 81.47 per cent as compared with 79.26 per cent during the preceding year, showing a very commendable increase of 2.21 per cent in the turn over.

**Patients treated.**—The total number of patients treated was 976,216, comprising 70,622 inpatients and 905,594 outpatients, as compared with 962,953 (67,788 inpatients and 895,165 outpatients) in 1934. The increase of 13,263 in the number of patients treated is attributable to the growing popularity of the institutions.

Deaths among inpatients in all the Calcutta hospitals numbered 7,500 against 7,160 in the preceding year,



giving a mortality rate of 10.61 per cent against 10.56 per cent of the previous year.

**Diseases: Cholera.**—During the year under report 5,179 cases of cholera were treated against 3,502 in 1934, with a mortality rate of 19.2 per cent against 17.9 per cent of the previous year. The number of cases treated for this disease has shown a steady increase during the last four years.

**Dysentery.**—Cases treated for this cause were 17,746 (13,397 amebic, 4,349 bacillary) as compared with 17,269 in the preceding year. The number of deaths among 1,358 patients treated in the indoor wards was 162 against 216 deaths in 1,573 patients of the previous year.

**Kala-azar.**—A slight decrease is noticeable in the number of kala-azar patients, viz, 5,974 against 6,195 in 1934. Of these 624 were treated as indoor patients with a mortality rate of 8.17 per cent against 10.68 per cent in the preceding year.

**Malaria** shows a remarkable decrease, the number of patients treated for it in 1935 being only 58,330 against 63,007 in 1934. The number of deaths among 1,701 inpatients was 95 as compared with 96 in 1,687 patients in the preceding year.

**Leprosy.**—One thousand five hundred and thirty-six cases were treated in 1935 as compared with 1,109 in the preceding year, showing an increase of 427 patients. Of these, 506 patients were treated in the Leprosy Department of the School of Tropical Medicine and the rest in other hospitals.

**Influenza.**—Thirty-six thousand two hundred and seventy-four cases were treated for influenza in 1935 against 34,646 in the year 1934, showing an increase of 1,628 patients. The death toll among 998 inpatients was 32 against 25 among 1,358 in the preceding year.

**Smallpox.**—Six hundred and forty-two smallpox cases were treated during the year against 590 cases in the year 1934.

The mortality rate in 1935 was 30.9 per cent against 31.5 per cent in the previous year.

**Tuberculosis of lungs.**—The number showed a slight increase, viz, 13,875 in 1935 as compared with 13,745 in the previous year.

Of the total, 1,585 were treated in the indoor wards, with a death rate of 35.7 per cent against 36.9 per cent of the preceding year.

**Epidemic dropsy.**—There was a large increase in the number of cases treated for this disease during the year, viz, 9,843 in 1935 against 6,054 in 1934. The death rate among the inpatients in 1935 was 28.1 per cent against 11.4 per cent in the preceding year.

**Diseases of the eye.**—Ninety-five thousand eight hundred and fifty-eight patients in all were treated for this cause. The figures include 7,272 for trachoma, 6,438 for glaucoma, 10,008 for cataract and 72,140 for other diseases of the eye. There is an increase of 8,362 patients this year as compared with the previous year. The Eye Infirmary of the Medical College Hospitals dealt with 38,963 patients, the largest number, for any one hospital. These included 767 cases of trachoma, 1,623 of glaucoma, 2,525 of cataract and 34,048 of other diseases of the eye. The corresponding total for the year 1934 was 36,156.

**Diphtheria.**—Eight hundred and ninety-two cases of diphtheria were treated during the year 1935 against 299 cases in the year 1934. The death rate was 16.2 per cent against 20.4 per cent in the previous year.

**Veneral diseases.**—Fewer persons resorted to the hospitals for treatment of this disease during the year.

**Surgical operations.**—Ninety-six thousand five hundred and ninety-five operations were performed on 71,028 patients in 1935, as compared with 80,847 operations on 57,797 patients in 1934. The number of deaths was correspondingly larger, viz, 1,284 against 1,176 in the preceding year.

The Campbell Hospital performed the largest number of operations, viz, 26,223 including 2,181 selected and important. The Medical College Hospitals came next with 24,124 operations of which 5,192 were selected. The Carmichael Medical College Hospital, Belgachia, performed 7,477 operations including 2,222 selected.

The total number of selected and important operations performed was 13,558 against 11,587 in 1934.

**Finance: Income.**—The total income of the Calcutta hospitals and dispensaries under classes I, III and IV during the year amounted to Rs. 34,46,846 as compared with Rs. 33,12,442 in the preceding year.

There was an increase of over Rs. 80,000 in Government contribution during 1935.

**Expenditure.**—Excluding investments, the expenditure of the Calcutta hospitals and dispensaries under classes I, III and IV amounted to Rs. 33,28,986 against Rs. 32,86,461 in 1934, showing an increase of Rs. 42,525.

**Mental observation ward.**—The accommodation remained the same as before, viz, six beds including two paying beds for Europeans and 24 beds including three paying beds for Indians and two beds for segregation.

There were in all 98 patients during the year, viz; six remaining over from the previous year, 91 newly admitted and one readmitted. Of these, 43 patients (30 males and 13 females) were certified and sent to Ranchi, 18 (13 males and 5 females) certified but released, 23 (9 males and 14 females) released as uncertifiable, 5 (4 males and 1 female) removed to jails and three patients (male) removed by the Committing Magistrates before report, and one patient (female) was discharged otherwise. Only five cases (4 males and 1 female) remained in the ward at the close of the year.

#### MOFUSSIL HOSPITALS AND DISPENSARIES

**Number.**—The number of dispensaries newly opened during the year was 39, viz, 35 following the western system and four following the homoeopathic system. Only four hospitals and dispensaries following the western system were closed. The number of institutions at the close of the year was 1,298 following the western system, 69 following homoeopathic system, 11 following the ayurvedic and four following the unani system, or in all 1,382 against 1,347 of the preceding year.

Besides, there was a number of temporary dispensaries and medical centres opened by the district health officers in certain districts for the treatment of kala-azar and malaria cases.

The 31 temporary dispensaries in the district of Nadia have subsequently been converted into permanent institutions.

The two itinerant dispensaries at Darjeeling and Chittagong Hill Tracts worked as usual throughout the year.

**Beds.**—The total number of beds in the indoor wards of hospitals in the mofussil at the close of 1934 was 6,000, viz, 4,458 for males and 1,542 for females. During the year under report 67 beds (20 for males and 47 for females) were added. The total number of beds thus came to be 6,067 (4,478 for males and 1,589 for females) at the close of the year.

**Patients treated.**—Patients treated in the permanently established hospitals and dispensaries following the western system both indoor and outdoor numbered 9,236,424 against 9,090,020 in 1934, showing an increase of 146,404 patients, while those treated in temporary itinerant and subsidized dispensaries and medical centres, numbered 527,043 against 504,906 in the previous year, thus showing an increase of 22,137 patients.

The dispensaries following other than the western system treated a total number of 451,963 outpatients as compared with 453,777 in 1934, a decrease of 1,814.

As remarked last year, the figures again indicate that these institutions were not so popular with the public as those under the western system where a large increase of patients is noticeable, both in the indoor and outdoor departments, and continues to be so from year to year.

**Diseases: Cholera.**—There was an increase in the number of cases treated for this disease, 8,992 as compared with 7,552 in 1934. Deaths recorded were 499 (5.5 per cent) against 326 (4.3 per cent) in the previous year.



The largest number of cases was treated in the district of 24-Perganas, viz., 1,013. Darjeeling is the only district where apparently no case of cholera occurred.

**Dysentery.**—The number of cases of this disease also shows a slight increase, 204,570 (176,958 amœbic and 27,612 bacillary) against 202,208 in 1934. The number of deaths was 389 against 419 in the preceding year. The largest number of cases occurred in the Dacca district, viz., 21,942.

**Kala-azar.**—A slight increase is noticeable also in the number of cases of kala-azar, 75,057 against 73,891 in 1934. The number of deaths, however, remained almost the same, viz., 317 against 319 in 1934. The largest number of cases occurred in the district of Rangpur, viz., 7,337.

**Malaria.**—Malaria accounted for the largest number of patients treated in hospitals. There was, however, a marked decrease in the total number, 2,877,825 against 3,035,340 in the year before. Decrease also occurred in the number of deaths, viz., 275 against 395 in 1934. The district of Hooghly treated the highest number of malaria cases, viz., 216,484.

**Influenza.**—The number of cases treated for the disease was 179,757 as compared with 160,504 in 1934, showing an increase of 19,253.

**Smallpox.**—The disease appears to have been less prevalent during the year under report. There were 591 cases against 710 in 1934. Deaths occurred in 39 cases against 51 in the preceding year. The district of Hooghly accounted for the largest number of cases, viz., 117.

**Tuberculosis of lungs.**—An appreciable increase is noticeable in the number of cases treated for this disease in the year under report, 15,222 patients against 13,916 in 1934, showing an increase of 1,306 patients or 9 per cent.

Besides the above number treated in the general hospitals and dispensaries in the mofussil, 255 patients (including 182 new admissions) were treated in the Jadabpur T. B. Hospital against 193 in 1934.

**Epidemic dropsy (including beri-beri).**—Patients treated for this disease showed a very marked increase, 15,553 in 1935 against 7,182 in 1934—an increase of over cent per cent. The total number of deaths was 35 against 4 in 1934.

The district most affected with the disease was 24-Perganas, with a record of 4,096 patients. Other districts where it was greatly prevalent appear to be Bakarganj (2,672), Khulna (1,410), Howrah (1,093) and Jessore (1,041).

**Veneral diseases.**—The number of patients treated for this class of disease increased during the year.

**Leprosy.**—Patients treated for leprosy in the general hospitals and dispensaries in the mofussil numbered 4,972 against 5,015 in 1934.

Besides the above, 829 indoor and 1,553 outdoor patients were treated in the special leper hospitals at Gobra (Calcutta), Raniganj (Burdwan) and Bankura, against 837 indoor and 1,378 outdoor patients in 1934. Of the indoor patients, 10 were cured, 237 discharged otherwise, 60 died.

The cost of upkeep of the three leper hospitals amounted to Rs. 82,944, of which Rs. 80,018 were contributed by Government.

**Diseases of the eye.**—A noticeable increase occurred in the number of patients treated for this group of diseases, 411,138 patients against 331,946 in 1934.

**Surgical operations.**—In all classes of hospitals and dispensaries in the mofussil, 156,853 surgical operations were performed during the year on 155,537 patients as compared with 153,162 operations on 150,297 patients in 1934.

**Finance: Income.**—The total receipts of hospitals and dispensaries in classes I, III and IV amounted to Rs. 33,12,911 during the year under report, as compared with Rs. 27,15,848 in 1934, showing an increase of Rs. 5,97,063.

**Expenditure.**—The total cost of the upkeep of hospitals and dispensaries under classes I, III, and IV, excluding investments, was correspondingly larger and

amounted to Rs. 28,47,865 against Rs. 25,75,946 in 1934.

Increase occurred under all the heads except 'diet', and is due mainly to the opening of the new institutions and better working of the existing ones.

**Nursing.**—Nursing in all the hospitals in Calcutta with the only exception of the Presidency General Hospital, as well as in the mofussil, is still unsatisfactory. This is due partly to want of funds and partly to lack of a sufficient number of trained nurses.

Conditions remained very much the same as noted last year but during the year under report, the nursing staff was slightly strengthened in some institutions.

The number of registered nurses in Bengal at the end of 1935 was 887 against 839 at the end of 1934.

In all 258 pupils were under training at various centres of whom 16 passed the senior certificate examination and 31 the junior examination during the year.

X-ray installation was added to four of the mofussil hospitals bringing the number of mofussil hospitals equipped with this facility now to 12.

# ANNUAL REPORT OF THE MYSORE STATE DEPARTMENT OF HEALTH FOR THE YEAR 1935. VOLUMES I AND II. BY P. PARTHASARATHI, L.M.S., B.Sc., L.R.C.P., L.R.C.S., D.P.H., D.T.M., DIRECTOR OF HEALTH

## VOLUME I

**Bureau of epidemiology and communicable diseases.**—  
(a) **Malaria control.**—Experimental control of malaria by the use of paris green was continued in the malaria stations at Nagenahalli, Mudgere and Hiriyur. The work of malaria relief in the Irwin Canal area was transferred from the public health to the medical department. A scheme was sanctioned in co-operation with the Rockefeller Foundation for the experimental control of malaria in ten select villages round about Mandya town, with a view to studying the possibility of economic control of malaria in rural areas. A new research station under the auspices of the Government and the Rockefeller Foundation was opened at Gargeswari, T-Narsipur taluk, for studying the existence of races, if any, in one of the local species of malaria-carrying mosquitoes and was closed on 31st December, 1935. During the year, special malaria surveys were also made of Shimoga town, Princess Krishnammanni sanatorium, Mysore, Bowringpet taluk and Periapatna sub-taluk. In the last place, heavy hookworm infection in addition to malaria was noticed.

(b) **Hookworm campaign.**—Hookworm treatment continued to be done in the dispensaries of Shimoga, Kadur, Hassan and Mysore. The total number of persons treated during the year in these and other districts was 20,734 against 15,911 during the previous year.

(c) **Guinea-worm control.**—The investigation of the biological method of control of guinea-worm was begun in April 1935, and was continued till the end of December. Mr. V. Narasinha Murthy, health officer, who did the work in this connection has been granted a fellowship by the Rockefeller Foundation for higher studies in America.

(d) **Epidemics.**—The number of deaths from plague and smallpox during 1935 was 1,822 and 10,067, respectively, against 5,890 and 4,521, respectively, during the previous year. Under fevers, separate figures have been given for the first time under malaria, typhoid and other fevers, the number of deaths under these heads being 24,623, 4,071 and 14,352, respectively, giving a total of 43,046 against a total of 56,502 during 1934. The total number of anti-plague inoculations and vaccinations done during the year was 69,664 and 408,814, respectively. A total of 1,407 deaths from cholera was reported during the year (against 346 during 1934) and effective preventive action was taken.

**Rural health.**—In the unit at Mandya, plague and smallpox prevailed throughout the year and the latter was in a severe form. A total of 3,363 plague inoculations and 9,307 vaccinations was performed in the unit area during the year. The two midwives attached to the unit visited 1,959 maternity cases in addition to conducting 55 labour cases.

the cargo. The committee considered that as dengue was not a fatal disease and as each port could protect itself effectively against the infection by mosquito-control measures there was no necessity for imposing stringent quarantine regulations.

#### REPORT OF THE YELLOW FEVER COMMISSION

*Cases of yellow fever notified.*—During the first 9 months of 1936, the following cases were notified to the Office International d'Hygiène Publique: for South America, 16 cases of yellow fever in Bolivia, 181 in 7 States of Brazil, and 51 in Columbia; for West Africa, 13 cases in the French Colonies and 7 in the British Colonies.

*Mouse-protection tests.*—In the mouse-protection tests carried out with the co-operation of the Rockefeller Foundation in the Islands of the Caribbean Sea and in the different countries of Central America, it was found that the results of the tests agreed in general with the epidemiological facts already known. In Cuba, the youngest person whose test was positive was born in 1908. In Mexico, the last cases of yellow fever were reported in 1921, whilst 2 of the youngest donors were born in 1924 and 1 in 1925; the yellow fever infection would therefore seem to have lasted a little longer than appeared from the known cases. In Salvador, the youngest positive subject was born in 1925, one year after the last known case in that country.

In the Anglo-Egyptian Sudan, in the region of the Nuba Mountains, situated north-east of the Province of Bahr-el-Ghazal, positive protection tests were found in several districts (Eliri, Lafufa, Nyaro, Kau, Haiban and Gulfan). The proportion was high in some of these districts, reaching 78 per cent in the Kau district. It was not possible to establish any connection between these positive tests and the presence in the past of a disease clinically resembling yellow fever. The position is the same as that reported previously in various regions of Equatorial Africa (Upper Ubangi) where very high percentages of positive tests, up to 97 per cent, have sometimes been found.

In the Belgian Congo, new information relating to the protection test was obtained. In the Lower Congo, the serum of persons who gave negative results at the examinations carried out in 1932 and 1933 was re-examined; in 6 per cent of these persons the serum had become positive. No disease resembling yellow fever had occurred in the meantime, as far as is known, either in these persons or in the region. But all the persons whose serum had become positive lived in the same or in neighbouring huts. In the Libenge region, near Ubanzi, an epidemic of infectious jaundice occurred. In 1933, the percentage of positive tests in this region was 6 (adults 12, children 0); after the epidemic, 29 per cent of positive tests were found among natives who stated that they had not had jaundice, and 46 per cent among persons who had recovered from jaundice. Up to the present the disease has not been identified with yellow fever.

These findings show that it would be advisable to repeat the examination by means of the protection test, at an interval of several years, especially in regions in which the test gave only a small percentage of positive results, and especially if possible in persons who were negative at the first examination. It would also be interesting to confirm whether persons, whose protection test was positive at first examination, still gave a positive result at the end of several years.

*Vaccination against yellow fever.*—The pantropic yellow fever virus attenuated by culture on tissue has now been used, combined with immune serum, on 380 persons in London, 35 in New York and 500 in Rio de Janeiro. No reaction worth mentioning was observed which could be attributed to the virus.

Doctors Sawyer and Bayer of the Laboratories of the International Health Division of the Rockefeller Foundation, New York, have succeeded in preparing a hyperimmune serum from the rhesus monkey of which the average activity is equal to 20 times, and in some cases to 60 and 80 times, that of the usual activity of human sera. Of 535 persons on whom this serum was

used, only one showed a severe serum reaction. The use of such a serum would enable a much smaller dose to be injected in vaccinations with virus and immune serum.

The immunity produced by vaccination does not last so long as that which follows an attack of yellow fever. It would be advisable to make a re-examination, two or three years after vaccination, of the condition of immunity and, if this is very weak or absent, to revaccinate.

The Commission of Aerial Navigation had asked for an opinion on the following question: When a person has been exposed in a region to the danger of infection, what is the duration of the period, beginning from the time when the person left that region, during which he can be considered as liable to introduce yellow fever into another country in which the conditions are suitable for its spread. The Commission considers that the period is six days, corresponding to the duration of the period of incubation of yellow fever which was accepted after discussion in the International Sanitary Convention of 1926, and was also adopted in the International Sanitary Convention for Aerial Navigation of 1933. If such a person should show suspicious symptoms before the expiration of the six days, the danger of spread of yellow fever would be prevented by the application of isolation during the first three days of illness, the patient being screened from the bites of mosquitoes.

#### REPORT ON THE WORKING OF THE PUNJAB MENTAL HOSPITAL, LAHORE, FOR THE YEAR 1936

The actual number of patients in the Mental Hospital was less than in recent years, the maximum number being 1,064 as against 1,158 in 1935 and 1,127 in 1934. The report shows that this was due to a strict control of admissions, patients being chosen as far as possible who were curable. In fact the number of admissions was only 129 during the year as against 223 in 1935 and 350 in 1934, and only 9 criminal patients are included in the number of admissions. This policy has no doubt improved the conditions in the mental hospital, but the indications are that the numbers seeking admission are steadily increasing and the result of the restrictions on admissions is that a large number of criminal and other mental cases are perforce being accommodated in the various jails in the province where the provision for their treatment is less satisfactory. To meet this situation and the growing needs of the hospital it was decided to build additional accommodation for 300 male patients, and the work is now in progress. The accommodation for female patients is also inadequate, but it has not been found possible to finance any further building operations for the present.

The death rate shows a further decline from 3.96 to 3.58, the figures showing a substantial improvement on the preceding few years. The percentage of patients cured to the number admitted remains about the same, though there has been a remarkable increase in the case of females, from 8.0 per cent to 32.0 per cent.

## Service Notes

#### APPOINTMENTS AND TRANSFERS

MAJOR-GENERAL E. W. C. BRADFIELD, C.I.E., O.B.E., K.H.S., Director-General, Indian Medical Service, appointed to be member of the Academic Council of the Delhi University.

Colonel N. M. Wilson, O.B.E., Inspector-General of Civil Hospitals, C. P. and Berar, on return from leave, is appointed Surgeon-General with the Government of Madras from 16th September, 1937.

Lieutenant-Colonel J. A. S. Phillips, C.I.E., appointed Viceroy's Honorary Surgeon. Dated 2nd March, 1937.

Lieutenant-Colonel R. Sweet, M.S.O., appointed to officiate as Assistant Director-General, Indian Medical

Service (Stores), with effect from the 4th September, 1937, pending the return from leave of Lieutenant-Colonel W. M. Will.

Lieutenant-Colonel A. H. Shaikh, lately Deputy Director-General, Indian Medical Service, has reverted to U. P. Jail Department and has been posted as Superintendent of Jails, Agra.

Lieutenant-Colonel M. A. Jafery, Superintendent of Jails, has been transferred from Agra to Lucknow.

Lieutenant-Colonel H. Stott has been selected for appointment as Inspector-General of Civil Hospitals, Bihar.

Lieutenant-Colonel H. S. Cormack filled the whole-time appointment of Ophthalmic Surgeon, Rangoon General Hospital. Dated 13th August, 1937.

Lieutenant-Colonel R. C. Phelps appointed as Medical Superintendent, General Hospital, Rangoon. Dated 13th August, 1937.

On return from Java, where he was sent on deputation, Lieutenant-Colonel C. M. Nicol resumed charge of the office of Director of Public Health, Punjab, on the forenoon of the 30th August, 1937.

Lieutenant-Colonel J. P. Canteenwala, Officiating Director-General, Indian Medical Service (Stores), reverted to the Medical Store Department. Dated 3rd September, 1937.

Lieutenant-Colonel J. C. Bharncha, I.M.S., Principal, Medical School, Agra, on return from leave, has resumed charge from 11th September, 1937.

Major R. McRobert appointed as Civil Surgeon, Maymyo. Dated 16th August, 1937.

Major M. Taylor returned from leave and took over charge of the European Mental Hospital, Ranchi, on 26th September, 1937.

Major E. G. Montgomery, Civil Surgeon, Jalpaiguri, on relief, is posted to Dacca as Civil Surgeon, vice Major R. Linton, granted leave.

Major G. P. F. Bowers, Civil Surgeon, Patna, reverted to the Military Department, on 28th September, 1937.

Captain W. W. Laughland, Officiating Superintendent, European Mental Hospital, Kanke (Ranchi), transferred to Yeravda Mental Hospital, on 26th September, 1937.

Captain F. H. A. L. Davidson, Civil Surgeon, Midnapore, on relief, is posted to Jalpaiguri, as Civil Surgeon, vice Major E. G. Montgomery (now on leave).

Captain F. W. Allinson, Second Resident Medical Officer, Presidency General Hospital, Calcutta, on relief, is posted to Midnapore as Civil Surgeon, vice Captain F. H. A. L. Davidson, transferred.

Captain A. C. Taylor, Civil Surgeon of Monghyr, was appointed Civil Surgeon of Patna from 28th September, 1937.

The services of Captain Jaswant Singh, who was lately Superintendent of Jails, Lucknow, and later, on special duty in the office of the Inspector-General of Prisons, U. P., have been replaced at the disposal of the Government of India.

#### *To be Captains (on probation)*

Patit Paban Chowdry, M.C. Dated 22nd November, 1936, with seniority in the rank of Captain from 22nd November, 1930.

Shiv Parshad Bhatia. Dated 5th November, 1936, with seniority in the rank of Captain from 12th April, 1933.

Man Singh. Dated 5th November, 1936, with seniority in the rank of Captain from 1st May, 1934.

Mir Naeem Mahmood. Dated 5th November, 1936, with seniority in the rank of Captain from 22nd May, 1934.

Nisar Mohd. Durrani. Dated 5th November, 1936, with seniority in the rank of Captain from 16th February, 1936. (Since deceased.)

Ramaswami Duraiswami Ayyar. Dated 5th November, 1936, with seniority in the rank of Captain from 7th October, 1935.

Maung Shwe Zan. Dated 4th December, 1936.

#### LEAVE

Lieutenant-Colonel J. H. Smith was recommended 8 months' leave by the Medical Board from the 27th July, 1937.

Lieutenant-Colonel G. M. Moffatt was granted leave on average pay for 8 months from the 1st August, 1937.

Major W. Scott, Civil Surgeon, Chhindwara, is granted leave for 1 year from 23rd September, 1937.

Major R. Linton, Civil Surgeon, Dacca, is granted leave for 1 year, with effect from the 21st October, 1937.

#### PROMOTION

##### *Majors to be Lieutenant-Colonels*

S. N. Hayes. Dated 9th September, 1937.

D. R. Thapar. Dated 25th September, 1937.

##### *Captains to be Majors*

Dated 2nd August, 1937

S. S. Bhatnagar.

B. Chaudhuri.

H. L. Batra.

Dated 15th August, 1937

A. V. O'Brien.

S. T. Davies

Dated 18th August, 1937

L. Dass.

S. M. K. Mallick.

T. C. Puri.

Dated 19th August, 1937

C. Mani.

R. R. Bakshi.

Dated 20th August, 1937

E. S. S. Lucas.

Dated 31st August, 1937

H. W. Farrell.

##### *Lieutenants to be Captains (Temporary Commissions)*

M. Akram. Dated 2nd June, 1937.

D. S. Raju. Dated 4th June, 1937.

B. S. Bindra. Dated 16th June, 1937.

M. S. Chadha. Dated 19th June, 1937.

W. A. Mirza. Dated 21st June, 1937.

M. M. Gyi. Dated 9th July, 1937.

## Notes

### 'MANETOL'

'BAYER' laboratories have recently put on the market under the name 'Manetol' an extract of the spinal cord having a strong hæmostatic effect. It is a dry substance put up in ampoules each containing 10 biological units. The contents of an ampoule is dissolved in 1 to 2 c.cm. of sterile water before injection. Manetol is available in boxes containing 5 ampoules of the dry substance and 5 ampoules of 2 c.cm. sterile water.

1 to 3 ampoules in the course of 24 hours have been found sufficient in average cases; severe cases require 5 to 6 ampoules.

Manetol shortens the bleeding time and thereby acts as an anti-hæmorrhagic. The indications for manetol include various kinds of hæmorrhage particularly the internal ones that are practically inaccessible to ordinary surgical approach.

### 'IOCAPRAL'

'IOCAPRAL', a spasmolytic and vaso-regulator in cardio-vascular diseases, has been recently introduced by the 'Bayer' laboratories. It is a combination of theobromine, calcium, iodine and prominal in suitable proportions and is available in tubes of 20 tablets.

The ingredient components plainly show the indications for this preparation, viz, arteriosclerosis, hypertonia, angina and other vaso-spastic conditions.

**Bureau of health education.**—The total number of cinema shows organized during the year was 178, the total number of persons that attended them being about 106,000 including ladies and school children. Nineteen articles on health subjects in English and Kannada were sent to the local newspapers for publication, while posters and leaflets on plague, smallpox, soil-pollution; bore-hole latrines, malaria, filth diseases, water and house-fly, hookworm and fruits and vegetables were printed and freely distributed.

**Bureau of laboratories.**—(a) *Public health institute.*—The total number of specimens examined in the institute during the year was 8,656 in the bacteriological section, 701 in the chemical section and 271 cases with 1,254 articles in the medico-legal section against 9,065, 676, 221 and 657, respectively, during 1934. During the year under review, 1,775 c.c. of T.A.B. vaccine were prepared in the institute and supplied to the health officers of Bangalore and Mysore cities and the medical officer, Krishnarajendra Hospital.

(b) *Vaccine institute.*—Both lanoline and glycerine lymphs were prepared and issued, the total quantity issued being enough for 379,162 and 69,855 cases, respectively. The total income and expenditure of the institute was Rs. 24,236 and Rs. 21,853 against Rs. 24,692 and Rs. 21,589, respectively, in the previous year.

**Bureau of sanitary engineering.**—The activities of the bureau continued as in previous years.

**Bureau of maternity and child welfare.**—Dr. (Mrs.) Erika Duessen Rosenthal, who was appointed organizer, adviser and inspecting officer of all maternity, child welfare and other welfare works, took charge of her duties in the beginning of January 1935. She delivered 36 lectures on maternity, child welfare and allied subjects, inspected 35 welfare centres and gave 13 health talks.

**General.**—The state of public health was generally good. The Indian Red Cross Society and the other voluntary organizations continued to do useful work.

## VOLUME II

**Bureau of vital statistics.**—Figures have been collected for the first time for the whole State, of death from malaria, typhoid, consumption, leprosy, child-birth, drowning, snake-bite, and rabies.

**Population.**—The estimated population of the state as on 1st July, 1935, was 6,669,120 as compared with the census population of 6,423,189 on 26th February, 1931. The estimated increase during the year, was 56,634 whilst the increase based on the excess of births over deaths amounted to 39,385.

**Births.**—During the year 136,359 births were reported, giving a birth rate of 20.45 per mille of population, as compared with 17.74 in the preceding year.

**Stillbirths.**—Statistics of infants born dead have been compiled for the first time, the number of stillbirths reported during the year being 2,110, giving a rate of 15.24 per 1,000 births including stillbirths.

**Deaths.**—As compared with 113,591 in the previous year a total of 96,974 deaths was reported in the year under report. The computed death rate was 14.54 against 17.18 in the preceding year.

**Infant mortality.**—A total of 15,769 deaths of infants under one year of age was recorded, giving an infant mortality rate of 115.64 per 1,000 live births, as compared with 121.28 in the preceding year. The rate in city areas was 165.61, in urban (cities included) areas 120.70 and in rural areas 114.21, respectively.

## Chief diseases

**Plague.**—As compared with 5,890 in the previous year 1,822 deaths were reported during the year. Nanjangud taluk was the worst affected. The fatality rate was 57.3 per cent. The incidence was heaviest in January with 440 deaths and lightest with 59 deaths in the month of May.

**Smallpox.**—During the year 10,067 deaths were reported as compared with 4,521 in the preceding year, showing an increase of 5,546 deaths.

The fatality rate was 20.9 per cent. The taluk worst affected was Kankanahalli.

**Cholera.**—As against 346 deaths reported in 1934 a total of 1,407 deaths was registered this year. A rise in the incidence was first noticed in July and an increased rise in August continued till the end of the year. Cholera in Mysore State, although not in any sense endemic, does rise to epidemic proportions once every six years as has been forecasted by Colonel Russell, Public Health Commissioner to the Government of India.

The fatality rate was 55.0 per cent. Hiriyur taluk was the worst affected. The death rate per 100,000 of population was the highest (76) in Chitaldrug district whilst Shimoga district was completely free.

**Malaria.**—A total of 24,623 deaths was reported during the year. Of these deaths 943 occurred in urban areas and 23,680 in rural areas. The highest incidence (2,883) was reported in December and the lowest (1,640) in June.

**Typhoid.**—During the year 4,071 deaths were reported under typhoid, giving a death rate of 61 per 100,000 of population.

**Other fevers.**—Excluding malaria and typhoid 14,352 deaths were reported under other fevers, giving a mortality rate of 215.

**Dysentery and diarrhoea.**—As compared with 5,225 in the previous year a total of 5,832 deaths was reported. The average mortality rate was 87 for the state as against 79 in the previous year.

**Respiratory diseases.**—Excluding consumption the number of deaths reported from respiratory diseases was 4,131 as compared with 4,389 in the previous year. The mortality rate was 62 during the year against 66 in the previous year.

**Consumption.**—During the year 4,510 deaths were reported under consumption. The average mortality rate was 68 for the whole state as compared with 204 for the cities.

**Leprosy.**—The total number of deaths due to leprosy as reported for the first time was 714 during the year.

**Child-birth.**—During the year 2,205 deaths from child-birth were reported, the maternal mortality per 1,000 births being 16.7.

**Miscellaneous.**—During the year 191 suicides were reported as compared with 218 in the previous year. There were 779 deaths from drowning and 745 deaths from wounds and accidents. A total of 154 deaths was caused by snake-bites and 54 deaths were reported from rabies. There were 21,260 deaths from all other causes.

## ANNUAL REPORT OF THE NATIONAL ASSOCIATION FOR SUPPLYING MEDICAL AID BY WOMEN TO THE WOMEN OF INDIA (COUNTESS OF DUFFERIN'S FUND INCLUDING THE WOMEN'S MEDICAL SERVICE) FOR THE YEAR 1936

THE year 1936 has been a very sad one in the history of the association for it reports the death of the founder of our association—the Dowager Marchioness of Dufferin and Ava, whose long and useful life came to an end on 27th October, 1936. It was in the year 1883 that the Countess of Dufferin, wife of the then Viceroy, arrived in India carrying with her a request from Queen Victoria that she should interest herself in measures for the medical relief by women to the women of India. At that time purdah was stricter than it is now and women would rather die than call in the aid of a medical man. Lady Dufferin, from the day of her arrival, began to consider the best methods by which a general scheme of medical relief for women could be started. She wrote to the wives of the Governors and Lieutenant-Governors in different parts of the country suggesting the formation of a national association to provide medical relief by women for the women of India and received the warmest possible response to the appeal. When Lady Dufferin left India she continued her work in England and up to the day of her death was still an active member of the Committee of the Dufferin Fund in the

United Kingdom, and lived to see the Jubilee Celebration of the Fund she started in India. As recently as last year when writing on the 50 years' work of the Dufferin Association, she says 'A small seed sown by Her late Majesty Queen Victoria, Empress of India, in 1884 has grown into a tree with branches spreading over many parts of India'. She will always have an honoured place in the history of British rule in India. Hers was a great life lived greatly to the very end.

The year 1936 has seen much good work begun. The plans for the re-building of the Dufferin Hospital at Calcutta are prepared and building operations have been started. The new hospital promises to be a fitting tribute to the memory of the late Lady Dufferin who was particularly interested in the present hospital, which has done such excellent service for the women of India. The sum of rupees one lakh was set aside from the Silver Jubilee Fund for the re-building of the Dufferin Hospital at Quetta. To this sum has been added another lakh from the Quetta Relief Fund. It is anticipated that this building will also start early in 1937. There is a scheme afoot for bringing about better conditions for the housing and training of nurses. It is being realized more and more how vital it is that we should have better trained nurses in our hospitals; this can only be achieved by raising the status of the nursing profession and attracting to it a better class of girl by offering her better conditions under which to live and train.

With this object in view the central committee of the Countess of Dufferin's Fund are proposing to allot to certain training schools for nurses, grants from the Silver Jubilee money, to enable them to make improvements in the training of the nurses; and also grants to Dufferin hospitals to assist them to build and furnish better nurses' quarters.

The Dufferin hospitals at Vizagapatam and Karachi have been greatly improved through grants from the Silver Jubilee Fund.

The year 1936 has also seen the establishment of the Ganesh Das Hospital for women and children, Shillong. Lady Keane, the Governor's wife, takes the greatest interest in this hospital and has done much to put it on a firm footing. It is now under the management of the provincial Countess of Dufferin's Fund. It is hoped that in another year the Dufferin Hospital at Amraoti will be rebuilt on a new and better site.

In April 1936, the Countess of Willingdon relinquished the presidency of the Association and was succeeded by Her Excellency The Marchioness of Linlithgow.

The Countess of Dufferin's Fund spent its income as usual during 1936 in grants to provincial Dufferin branches and to various hospitals and other institutions. A sum of Rs. 9,543 was spent on scholarships to students in medical colleges: 18 at the Lady Hardinge Medical College, Delhi; 3 at Bombay; 3 at Madras; and 3 at Calcutta. Of the total number of scholarships, 18 are awarded from Association funds, and the remainder from trust funds administered by the Dufferin Council.

The only big change in the Lady Hardinge Medical College, New Delhi, has been the opening of the Biochemistry Department. It is attached to the Pathology Department and will prove of great benefit to the students and the hospital.

The working of the Victoria Znanova Hospital, Delhi, during the year under review has been satisfactory, the number of maternity cases showing an increase again this year, a large percentage of them being normal, thus providing ample clinical material for the pupil midwives. A special antenatal clinic is held two afternoons a week and is proving very popular, a large number of pregnant women taking advantage of it.

Lady Reading Hospital, Simla, had a successful year of work. In fact compared with the last four years, the number of inpatients and operations this year has been the highest recorded.

#### LADY DUFFERIN VICTORIA HOSPITAL

*Patients.*—Inpatient numbers remain very much the same as during the past three or four years (3,667) and were approximately one-third maternity, one-third

gynaecological and the remainder medical, septic and children.

*Maternity wards.*—Number of labour cases excluding abortions has increased and was 1,079—the highest we have ever had—the absolute maximum which could possibly be admitted and represents very heavy work as every second case had some medical complication.

The amount of anaemia in pregnancy has been much greater than ever before—of a type so severe that blood transfusion was essential as an immediate measure and while this was given in 16 cases there were several who died a few hours after admission before a suitable donor could be arranged.

The eclampsias also have increased in number and severity.

#### THE MATERNITY AND CHILD-WELFARE SECTION, ALL-INDIA INSTITUTE OF HYGIENE AND PUBLIC HEALTH, CALCUTTA

##### 1. Teaching.—

*D.M.C.W. course.*—There were no students taking the course for the Diploma of Maternity and Child Welfare during the session 1935-36. One student began the course in October 1936. Practical difficulties arose in connection with accommodation for D.M.C.W. students during the midwifery course which has been arranged with the Eden Hospital. It is felt that the midwifery, venereal diseases and hospital antenatal work as at present arranged is far from satisfactory for this post-graduate course.

*D.P.H. course.*—Ten lectures and four demonstrations in maternity and child welfare and five lectures in school hygiene and medical inspection of schools were given to the students taking the D.P.H. course at the Institute of Hygiene during 1936.

2. *Welfare centre (Calcutta health week clinic).*—Antenatal, infant and toddler clinics were carried on as in previous years. Postnatal cards were brought into use.

During 1936, 389 antenatal cases of whom 54 per cent attended the centre were under care. There were 215 centre antenatal cases delivered during the year with one maternal death, a maternal mortality rate of 4.6 per 1,000 births. The maternal mortality rate in the whole district (half ward 8) was 28.6 per 1,000 births.

There were 436 infants put on clinic cards during 1936. Forty-two per cent of these attended the centre, the others only received home visits. The mortality of infants on cards was 119 per 1,000. This is higher than the previous year but the high rate is largely due to a severe epidemic of smallpox. The infantile mortality rate in half ward 8 was 196.4 per 1,000 live births.

The total clinic attendances of antenatal cases, infants and toddlers, during the year was 5,913. This is an average weekly attendance of 113.

A total of 5,775 home visits were paid during the year, an average of 240 visits per month by each health visitor.

#### REPORT BY MAJOR-GENERAL SIR JOHN MEGAW, K.C.I.E., M.B., D.Sc. (HON.), I.M.S. (RETD.), DELEGATE FOR INDIA, ON THE SESSION OF THE PERMANENT COMMITTEE OF THE OFFICE INTERNATIONAL D'HYGIENE PUBLIQUE, HELD IN PARIS FROM 19TH TO 28TH OCTOBER, 1936

*Pilgrimage.*—The pilgrimage of 1936 was almost the same as that of the previous year in point of numbers and in freedom from infection. Attention was called to the extended use of motor transport, no less than 2,000 pilgrims having traversed the route from Bagdad to Medina via Najaf by motor car. Preliminary arrangements are also being made to open a route from Damascus to Medina, but no quarantine arrangements have been made for this route. The use of aeroplanes is a very important innovation which will have to be studied very carefully.

*Quarantine.*—The committee expressed the opinion that the crews of ships coming from dengue-infected areas might properly be allowed to go on shore to work



the cargo. The committee considered that as dengue was not a fatal disease and as each port could protect itself effectively against the infection by mosquito-control measures there was no necessity for imposing stringent quarantine regulations.

#### REPORT OF THE YELLOW FEVER COMMISSION

*Cases of yellow fever notified.*—During the first 9 months of 1936, the following cases were notified to the Office International d'Hygiène Publique: for South America, 16 cases of yellow fever in Bolivia, 181 in 7 States of Brazil, and 51 in Columbia; for West Africa, 13 cases in the French Colonies and 7 in the British Colonies.

*Mouse-protection tests.*—In the mouse-protection tests carried out with the co-operation of the Rockefeller Foundation in the Islands of the Caribbean Sea and in the different countries of Central America, it was found that the results of the tests agreed in general with the epidemiological facts already known. In Cuba, the youngest person whose test was positive was born in 1908. In Mexico, the last cases of yellow fever were reported in 1921, whilst 2 of the youngest donors were born in 1924 and 1 in 1925; the yellow fever infection would therefore seem to have lasted a little longer than appeared from the known cases. In Salvador, the youngest positive subject was born in 1925, one year after the last known case in that country.

In the Anglo-Egyptian Sudan, in the region of the Nuba Mountains, situated north-east of the Province of Bahr-el-Ghazal, positive protection tests were found in several districts (Eliri, Lafufa, Nyaro, Kau, Haiban and Gulfan). The proportion was high in some of these districts, reaching 78 per cent in the Kau district. It was not possible to establish any connection between these positive tests and the presence in the past of a disease clinically resembling yellow fever. The position is the same as that reported previously in various regions of Equatorial Africa (Upper Ubangi) where very high percentages of positive tests, up to 97 per cent, have sometimes been found.

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used, only one showed a severe serum reaction. The use of such a serum would enable a much smaller dose to be injected in vaccinations with virus and immune serum.

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#### REPORT ON THE WORKING OF THE PUNJAB MENTAL HOSPITAL, LAHORE, FOR THE YEAR 1936

THE actual number of patients in the Mental Hospital was less than in recent years, the maximum number being 1,064 as against 1,158 in 1935 and 1,127 in 1934. The report shows that this was due to a strict control of admissions, patients being chosen as far as possible who were curable. In fact the number of admissions was only 129 during the year as against 223 in 1935 and 350 in 1934, and only 9 criminal patients are included in the number of admissions. This policy has no doubt improved the conditions in the mental hospital, but the indications are that the numbers seeking admission are steadily increasing and the result of the restrictions on admissions is that a large number of criminal and other mental cases are perforce being accommodated in the various jails in the province where the provision for their treatment is less satisfactory. To meet this situation and the growing needs of the hospital it was decided to build additional accommodation for 300 male-patients, and the work is now in progress. The accommodation for female patients is also inadequate, but it has not been found possible to finance any further building operations for the present.

The death rate shows a further decline from 3.96 to 3.58, the figures showing a substantial improvement on the preceding few years. The percentage of patients cured to the number admitted remains about the same, though there has been a remarkable increase in the case of females, from 8.0 per cent to 32.0 per cent.

## Service Notes

### APPOINTMENTS AND TRANSFERS

MAJOR-GENERAL E. W. C. BRADFIELD, C.I.E., O.B.E., K.H.S., Director-General, Indian Medical Service, appointed to be member of the Academic Council of the Delhi University.

Colonel N. M. Wilson, O.B.E., Inspector-General of Civil Hospitals, C. P. and Berar, on return from leave, is appointed Surgeon-General with the Government of Madras from 16th September, 1937.

Lieutenant-Colonel J. A. S. Phillips, C.I.E., appointed Viceroy's Honorary Surgeon. Dated 2nd March, 1937.

Lieutenant-Colonel R. Sweet, D.S.O., appointed to officiate as Assistant Director-General, Indian Medical



Service (Stores), with effect from the 4th September, 1937, pending the return from leave of Lieutenant-Colonel W. M. Will.

Lieutenant-Colonel A. H. Shaikh, lately Deputy Director-General, Indian Medical Service, has reverted to U. P. Jail Department and has been posted as Superintendent of Jails, Agra.

Lieutenant-Colonel M. A. Jafery, Superintendent of Jails, has been transferred from Agra to Lucknow.

Lieutenant-Colonel H. Stott has been selected for appointment as Inspector-General of Civil Hospitals, Bihar.

Lieutenant-Colonel H. S. Cormack filled the whole-time appointment of Ophthalmic Surgeon, Rangoon General Hospital. Dated 13th August, 1937.

Lieutenant-Colonel R. C. Phelps appointed as Medical Superintendent, General Hospital, Rangoon. Dated 13th August, 1937.

On return from Java, where he was sent on deputation, Lieutenant-Colonel C. M. Nicol resumed charge of the office of Director of Public Health, Punjab, on the forenoon of the 30th August, 1937.

Lieutenant-Colonel J. P. Canteenwala, Officiating Director-General, Indian Medical Service (Stores), reverted to the Medical Store Department. Dated 3rd September, 1937.

Lieutenant-Colonel J. C. Bharucha, I.M.S., Principal, Medical School, Agra, on return from leave, has resumed charge from 11th September, 1937.

Major R. McRobert appointed as Civil Surgeon, Maymyo. Dated 16th August, 1937.

Major M. Taylor returned from leave and took over charge of the European Mental Hospital, Ranchi, on 26th September, 1937.

Major E. G. Montgomery, Civil Surgeon, Jalpaiguri, on relief, is posted to Dacca as Civil Surgeon, *vice* Major R. Linton, granted leave.

Major G. P. F. Bowers, Civil Surgeon, Patna, reverted to the Military Department, on 28th September, 1937.

Captain W. W. Laughland, Officiating Superintendent, European Mental Hospital, Kanke (Ranchi), transferred to Yeravda Mental Hospital, on 26th September, 1937.

Captain F. H. A. L. Davidson, Civil Surgeon, Midnapore, on relief, is posted to Jalpaiguri, as Civil Surgeon, *vice* Major E. G. Montgomery (now on leave).

Captain F. W. Allinson, Second Resident Medical Officer, Presidency General Hospital, Calcutta, on relief, is posted to Midnapore as Civil Surgeon, *vice* Captain F. H. A. L. Davidson, transferred.

Captain A. C. Taylor, Civil Surgeon of Monghyr, was appointed Civil Surgeon of Patna from 28th September, 1937.

The services of Captain Jaswant Singh, who was lately Superintendent of Jails, Lucknow, and later, on special duty in the office of the Inspector-General of Prisons, U. P., have been replaced at the disposal of the Government of India.

#### *To be Captains (on probation)*

Patit Paban Chowdry, M.C. Dated 22nd November, 1936, with seniority in the rank of Captain from 22nd November, 1930.

Shiv Parshad Bhatia. Dated 5th November, 1936, with seniority in the rank of Captain from 12th April, 1933.

Man Singh. Dated 5th November, 1936, with seniority in the rank of Captain from 1st May, 1934.

Mir Naeem Mahmood. Dated 5th November, 1936, with seniority in the rank of Captain from 22nd May, 1934.

Nisar Mohd. Durrani. Dated 5th November, 1936, with seniority in the rank of Captain from 16th February, 1936. (Since deceased.)

Ramaswami Duraiswami Ayyar. Dated 5th November, 1936, with seniority in the rank of Captain from 7th October, 1935.

Maung Shwe Zan. Dated 4th December, 1936.

#### LEAVE

Lieutenant-Colonel J. H. Smith was recommended 8 months' leave by the Medical Board from the 27th July, 1937.

Lieutenant-Colonel G. M. Moffatt was granted leave on average pay for 8 months from the 1st August, 1937.

Major W. Scott, Civil Surgeon, Chhindwara, is granted leave for 1 year from 23rd September, 1937.

Major R. Linton, Civil Surgeon, Dacca, is granted leave for 1 year, with effect from the 21st October, 1937.

#### PROMOTION

##### *Majors to be Lieutenant-Colonels*

S. N. Hayes. Dated 9th September, 1937.

D. R. Thapar. Dated 25th September, 1937.

##### *Captains to be Majors*

Dated 2nd August, 1937

S. S. Bhatnagar.

B. Chandhuri.

H. L. Batra.

Dated 15th August, 1937

A. V. O'Brien.

S. T. Davies.

Dated 18th August, 1937

L. Dass.

S. M. K. Mallick.

T. C. Puri.

Dated 19th August, 1937

C. Mani.

R. R. Bakshi.

Dated 20th August, 1937

E. S. S. Lucas.

Dated 31st August, 1937

H. W. Farrell.

##### *Lieutenants to be Captains (Temporary Commissions)*

M. Akram. Dated 2nd June, 1937.

D. S. Raju. Dated 4th June, 1937.

B. S. Bindra. Dated 16th June, 1937.

M. S. Chadha. Dated 19th June, 1937.

W. A. Mirza. Dated 21st June, 1937.

M. M. Gyi. Dated 9th July, 1937.

## Notes

### 'MANETOL'

'BAYER' laboratories have recently put on the market under the name 'Manetol' an extract of the spinal cord having a strong hæmostatic effect. It is a dry substance put up in ampoules each containing 10 biological units. The contents of an ampoule is dissolved in 1 to 2 c.c.m. of sterile water before injection. Manetol is available in boxes containing 5 ampoules of the dry substance and 5 ampoules of 2 c.c.m. sterile water.

1 to 3 ampoules in the course of 24 hours have been found sufficient in average cases; severe cases require 5 to 6 ampoules.

Manetol shortens the bleeding time and thereby acts as an anti-hæmorrhagic. The indications for manetol include various kinds of hæmorrhage particularly the internal ones that are practically inaccessible to ordinary surgical approach.

### 'IOCAPRAL'

'IOCAPRAL', a spasmolytic and vaso-regulator in cardio-vascular diseases, has been recently introduced by the 'Bayer' laboratories. It is a combination of theobromine, calcium, iodine and prominal in suitable proportions and is available in tubes of 20 tablets.

The ingredient components plainly show the indications for this preparation, *viz.* arteriosclerosis, hypertonia, angina and other vaso-spastic conditions.

Half a tablet three times daily is found to be sufficient for all ordinary cases, while for severe cases even 1 to 2 tablets three times daily have been well tolerated.

### P.A.B.S.

(HEWLETT'S)

#### Para-Amino-Benzene-Sulphonamide

UNDER the simple but easily remembered name of P.A.B.S., Messrs. Hewlett have introduced the new chemotherapeutic compound p-amino-benzene-sulphonamide.

This relatively simple substance has been shown to have the property of rendering the blood bactericidal to streptococci when administered by the mouth. Protection can be obtained against different serological types, but no specific action against other organisms such as staphylococci or pneumococci has been recorded.

Evidence of its bacteriostatic and bactericidal action against hæmolytic streptococci has accumulated and the *Lancet* (5th December, 1936) says regarding the various sulphonamides on the market that 'it has become an imperative duty to employ them, not only in puerperal fever, but also in other severe forms of streptococcal infection'.

P.A.B.S. is indicated in puerperal sepsis, erysipelas, scarlet fever, streptococcal inflammation of the throat and tonsils, meningitis and streptococcal arthritis.

As a prophylactic, it may prevent many complications attributed to hæmolytic streptococci.

### Dose

P.A.B.S. is supplied in  $7\frac{1}{2}$  grain (0.5 gramme) tablets, and the dose is 2 to 3 tablets three times a day after meals, which can be reduced as the symptoms subside.

The prophylactic dose is 1 to 2 tablets twice or three times daily.

### 'WELLCOME' BRAND WHOOPING COUGH VACCINE

IN response to many requests Burroughs Wellcome and Company are issuing whooping cough vaccine. It should be mentioned, however, that there is no satisfactory laboratory test for potency, nor does the clinical evidence yet provide complete proof that all batches of vaccine made in different parts of the world are effective in prophylaxis, but as whooping cough is often so serious any promising prophylactic measure is worthy of trial. There is no general agreement that the vaccine is effective in the treatment of whooping cough.

'Wellcome' Brand Whooping Cough Vaccine is prepared at the Wellcome Physiological Research Laboratories from recent strains of *H. pertussis* (the Bordet-Gengou bacillus), isolated by the cough plate method, and the smooth virulent phase 1, described by Leslie and Gardner, 1931, *Journal of Hygiene*, 31, 423. Cultures grown on the Bordet-Gengou medium and killed by antiseptic constitute the vaccine.

As regards prophylaxis, in a recent paper Gardner, 1936, *Proceedings of the Royal Society of Medicine*, Vol. 29 [Section of Epidemiology (1)], stated that 'the evidence that has accumulated justifies the provisional belief that prophylactic vaccination is effective both in reducing the chances of attack and in attenuating the disease in those attacked. It is, of course, desirable that further statistics of really evidential value should be obtained'. Since whooping cough is most serious during the early years of life, it is advisable to immunize during infancy, preferably between the 7th and 10th months. It has been suggested by Sauer that a period of several months should elapse before the resulting immunity is complete, but other observers believe that a useful degree of immunity may be obtained in a much shorter period. Authorities differ as regards dosage. Madsen, for instance, recommends a total of 2 c.cm. of a 10 thousand million suspension, while Sauer recommends at least 8 c.cm. and preferably 10 c.cm. for all children over three years of age. The interval between injections recommended by Madsen is three to four days and by Sauer one

week. Kendrick and Elderling, 1936, *American Journal of Public Health*, 26, 8, employed the following dosage:—

Dose No.	Subcutaneous injection at site of	QUANTITY	
		Right	Left
1	Biceps	...	1.0 c.c.
2	Triceps	1.5 c.c.	...
3	Triceps	...	1.5 c.c.
4 and 5	Deltoid	1.5 c.c.	1.5 c.c.

= total 7.0 c.cm. (equivalent to 70 thousand million organisms).

Although it entails five injections, this is less tedious than some of the courses which have been recommended.

The injections may conveniently be given at intervals of one week. Reactions appear to be somewhat more troublesome than in anti-diphtheria immunization, especially in older children.

If the vaccine is adopted for treatment, injections should be begun as early in the disease as possible. Once the characteristic whoop has become established, little or no benefit from a course of vaccine can be expected. Some clinicians recommend six subcutaneous injections, each ranging from 100 million to 1,000 million organisms, administered on alternate days. Others suggest 1,000 million to 3,000 million for older children, increasing to 5,000 million or more organisms in six injections; smaller doses are stated by these workers to be less effective.

'Wellcome' Brand Whooping Cough Vaccine is issued in containers of 10 c.cm. 10,000 million organisms in each c.cm.

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## Original Articles

### GNATHOSTOMIASIS IN HUMAN BEINGS

By P. A. MAPLESTONE, D.S.O., D.Sc., M.B., Ch.B., D.T.M.  
and

N. V. BHADURI, M.B. (Cal.)

(From the Helminthological Research Laboratory,  
School of Tropical Medicine, Calcutta, and the Indian  
Research Fund Association)

THE first instance of human infection with the parasite *Gnathostoma spinigerum* Owen, 1836, was recorded from Siam in 1889 and in the succeeding forty years (to 1929) only ten more cases seem to have been described, so that the tendency has been rather to look on the condition as a medical curiosity of no great importance. These cases were distributed as follows, five in Siam, one in a Chinese in the Malay States, three in Japanese in China, one in Japan and one in Bengal.

In the last eight years, however, Prommas and Daengsvang (1934) reported nine cases in Siam and said they had seen about twenty others which, from their clinical manifestations, were probably due to this worm but in which the parasite had not been found, and Castens (1935) in a matter of four or five years has seen forty cases, also in Siam, which he has ascribed to this cause. Maplestone also reported two more cases in Bengal and as a fourth has been seen recently it is deemed worth while again drawing attention to this condition because it is very probable that the infection is commoner than the records indicate, and as the worms can migrate anywhere in the body causing considerable reaction in the form of local œdema in the course of their wanderings, they may give rise to urgent symptoms, depending on the regions involved, as they did in two of the writers' four cases. One simulated acute mastoiditis and the other patient had difficulty in breathing for a time, while the worm was migrating up the side of the neck.

*Notes of the fourth case in Bengal.*—A young adult Bengalee, a dentist, who had never been farther from Calcutta than Benares and Puri for brief holidays, brought a worm for identification which he said he had removed the same day from the tip of the second finger of his left hand.

He gave the history that he first noticed an œdematous swelling about two inches in diameter on the inner side of his left arm just above the elbow, about three months ago. This only lasted a few days and was succeeded by several similar swellings which appeared in turn, each nearer the hand than its predecessor, indicating the course of migration of the worm. Finally, after producing a painful and swollen hand, the small object was observed just beneath the skin at the tip of the finger and was easily removed. When seen the day after removal of the worm practically all the symptoms had disappeared and the hand was almost normal.

The worm proved to be an immature gnathostome, probably *G. spinigerum*. It had only four rows of spines on the cephalic bulb and was

only 2.5 mm. in length, but in its living state it almost certainly had been a good deal longer as it was greatly contracted, having died before fixation. Sexual differentiation was of course not established.

In twenty-five of the reported cases the site of the worm has been given and they may be found anywhere either on the body surface or in the internal organs, there being evidence that the lungs, stomach and kidneys have been affected by migration of these worms through their substance, and Castens reported one case in which there were definite signs of cerebral involvement.

Siam is undoubtedly the principal focus of this infection for Robert (1922) says he saw many cases, which on clinical grounds he considered must have been due to this parasite, before he was successful in discovering any worms and clinching the diagnosis. Prommas and Daengsvang (1934) and Castens (*loc. cit.*) also indicate that they have seen many cases suspected to be due to this cause without being able to find the worm. Because it seems likely that this condition is fairly common in Bengal, if not elsewhere in India as well, and it is never recognized for what it really is, it is proposed to give a short account of the clinical characteristics summarized from the description of the various authors who have dealt with the condition.

There is generally sudden onset of a localized swelling often of considerable dimensions, which may or may not be accompanied by pain of an acute boring or pricking nature. The swelling generally only lasts a day or two and disappears, often to be followed by another similar swelling generally not far from the original one, but in some cases mention is made of fugitive swellings appearing at irregular intervals in widely separated places such as the arms and legs, over a period of weeks or months. This type might be explained as being caused by multiple infections, but the remarkable thing is that removal of a single worm has always led to the immediate and complete cessation of signs so that it appears as if these parasites are able to migrate fairly rapidly throughout the body and cover considerable distances. The duration of the symptoms is very variable and if the worm does not happen to reach the body surface and be extracted or to escape by its own efforts (as it appears able to do) the condition may last for months or even over a year. Hæmatemesis, hæmoptysis and hæmaturia have been reported in one or two instances, the diagnosis of the cause being established by removal or natural evacuation of the worm and immediate cessation of symptoms. One of the most remarkable cases was that of Robert (*loc. cit.*) in which the patient suffered from hæmaturia for a time; this was followed by hæmatemesis and complete cessation of symptoms after a gnathostome escaped from the skin over the left hypochondrium. Occasionally the irritation caused by the worms

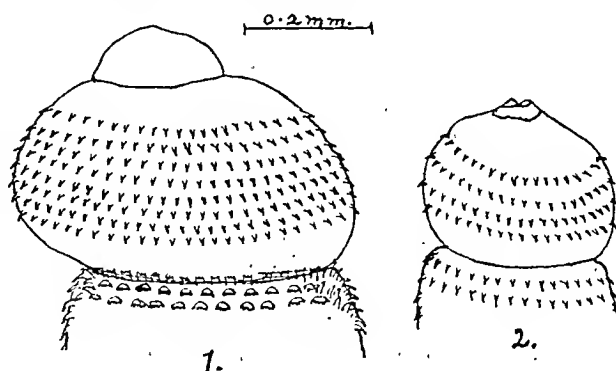
has been followed by suppuration and the formation of an abscess in which the parasite has been found. This complication appears to be especially likely in the breast. The serpiginous, itchy, raised line described in creeping eruption is exceptional, and probably only occurs when the worm is burrowing horizontally in the epidermis; when it is deeper in the corium or subcutaneous tissue, vascular reaction and exudation of fluid occur giving rise to a swelling which somewhat resembles angio-neurotic oedema. In nearly half the cases there has been swelling of the pharynx with varying degrees of dyspnoea at some time, in the course of the infection, caused by migration of the worm in the neck, and in more than one instance the worm has escaped through the mucous membrane of the pharynx or the inner surface of the cheek. The only other means of diagnosis, apart from finding the parasite, is that most cases have a relatively high eosinophilia, which would be of value if other causes of this condition can be excluded, but this is not an easy matter in the countries where gnathostomiasis occurs.

References to this condition are usually found under 'creeping eruption' or 'creeping disease'. It has been indicated above that the slightly raised serpiginous line typical of creeping eruption is exceptional in gnathostomiasis, and further it is not strictly a definite entity but is more correctly a sign which may be caused by other animal parasites such as various species of hookworm larvæ or fly larvæ. It accordingly seems advisable to remove the condition caused by migrating gnathostomes from the rather mixed collection known as creeping eruption and strictly to adhere to the definition based upon the cause and to call it 'gnathostomiasis' only.

The method of acquiring the infection was unknown until recently and many theories were advanced. Originally Morishita and Faust (1925) suggested that entry was probably gained through the skin by a free-living stages of the parasite, others thought it might be acquired in food, and then Prommas and Daengsvang (1933) found that freshly-hatched larvæ from eggs in water were devoured by cyclops and underwent development within them. So they considered it likely the worms were swallowed in water containing infected cyclops, a reasonable supposition in view of the life history of the guinea worm. They were unsuccessful, however, in infecting cats by this means, and so they sought a second intermediate host and readily infected fresh-water fish by giving them cyclops containing larvæ, and they finally successfully demonstrated the complete cycle by feeding cats on fish containing gnathostome larvæ and finding adult gnathostomes in cysts in the stomach wall of these cats [Prommas and Daengsvang (1936) and (1937)]. There is therefore little doubt that human infection is acquired in the same way.

For the information of those unaccustomed to the appearance of these worms two drawings of

the anterior end are given. One (1) is that of an adult with eight rows of spines on the cephalic bulb and the other (2) is that of a larva with four rows of spines on the same structure. Both of these are drawings of specimens actually recovered from human beings.



Cephalic extremities of *Gnathostomes*.  
1. Adult. 2. Larva (somewhat diagrammatic).

For purposes of recognition and for clinical diagnosis these worms can be examined in a liquid medium (formalin or 70 per cent alcohol) without clearing. For fuller examination of anatomical details and definite specific identification one or other of the approved clearing methods will have to be employed. In the un-cleared state the globular shape of the anterior end clearly divided off from the body by a deep circular groove is quite distinctive and the four or eight rows of spines on the bulb can be counted quite easily if the edge of the specimen is brought into focus, and the same applies to the body of the worm which is covered with closely-set rows of backwardly directed spines. The spines on the body of adults are very close together and have compound points near the anterior end of the worm, and as one proceeds posteriorly these spines become smaller, have simple points and are less closely set, and they cover practically the whole length of the body. In the larva the spines are simple throughout and are arranged in rows corresponding to the transverse striations of the skin, they also become smaller as one proceeds posteriorly and they become invisible at about half the length of the worm.

The arrangement of these closely-set spines explains how the worms are able to migrate so actively through the tissues. This can be appreciated if one takes a similarly-armed grass seed between the fingers and rubs the fingers together when it will be observed that the seed always rapidly moves point forwards and away from the direction of the spines no matter how much attempts are made to make it move in the opposite direction by appropriate to and fro movements.

So as to preserve these worms in a good state for future examination if obtained alive, they should be first well washed by shaking vigorously in a test-tube partly filled with normal

(Continued at foot of opposite page)

# ORGANIZATION OF A BLOOD TRANSFUSION SERVICE IN A DISTRICT HOSPITAL

By P. C. DUTTA, M.B., F.R.C.S. (Edin.)  
CAPTAIN, I.M.S.

Civil Surgeon, Sargodha, Shahpur

THE organization of a blood transfusion service is not so difficult as would appear at first sight. It may not be possible to run a very efficient service but a workable one can be easily organized in a district headquarters. The success of such a scheme depends on preliminary arrangements and the co-operation of the hospital staff who should know the details of the work.

Previously I used to depend on the local police force for the donors, but at the present moment the following method is adopted:—

A letter is sent to the heads of the various government departments, Boy Scout and Seva Samiti organizations asking for volunteers. In the appeal special mention is made that the donor's action amounts to giving life to a dying person, and that the operation is painless and free from any harmful effect whatsoever. A special letter is sent to the superintendent of police and personal influence is also exerted there as much as possible. The police donors are only used when no other suitable donor is available. Of course in every case, an effort is made to get a suitable donor from among the relatives and friends and if that be not possible then only people from the permanent list are requisitioned.

Copy of letter.

Dear Sir,

Transfusion of fresh blood is the most efficient method of treatment and often life-saving for certain diseases and injuries. I am trying to organize a blood transfusion service and hope you will help me.

For transfusion of blood, healthy young men are required from whom the blood can be taken. It is one of the most humanitarian

and life-saving acts on the part of the donor. The process of taking out blood is painless and has no deleterious effect on the system of the donor whatsoever.

My scheme is to maintain a list of those people who are desirous to volunteer themselves for the purpose, so that in case of an emergency they may be at once summoned to the hospital. Healthy young men, between 20 and 30, are the suitable people. I again beg to emphasize that the act of the donor amounts to giving life to another person.

Would you kindly endeavour that suitable people among your staff may volunteer for the purpose and a list of the volunteers may please be sent to me. On receipt of this further detailed instructions will be issued to the persons concerned.

When the lists of volunteers are received, they are asked to report at the hospital.

When the prospective donor reports to the hospital, he is thoroughly examined and a case card is prepared in which certain details are entered. His blood is also taken for the Wassermann reaction. For obvious reasons I prefer not to tell the person that blood is being taken for this purpose as it may turn away some of the volunteers.

Previously I used to test the blood for grouping, but I have given this up, because I find that if the services of six people are requisitioned, at least one of them is nearly always a suitable donor. Moreover, I prefer to do a compatibility test myself before transfusion in every case. To keep a record of the group of the donors is not very important in my opinion, where a number of volunteers are available and not many transfusions are done. But it is certainly useful for a big transfusion service, where donors will be required practically every day and their numbers are comparatively limited, so that only the minimum number may be called at one time.\*

(Sample case card for a volunteer)

Name	age
Detailed address	
Office	Residence
Medical notes	
Arm veins	
W. R.	
Any other Remarks	
Blood taken for Transfusion	
Date	Amount
Date	Amount

Note.—You are requested to inform the hospital if you are away from the station for more than three days. Please mention the date of return.

\* [Note.—It is a fact that 'if the services of six people are requisitioned at least one of them is nearly always a suitable donor'. But it seems very unnecessary to subject six persons to the inconvenience of having to report and the pain of a venepuncture each time blood is required for transfusion when one or two would do. If the blood is grouped as a preliminary measure when the Wassermann reaction is done, and a register kept, only two persons of a suitable group need be sent for each time. Whether there are many or few transfusions done this would seem to be the best method.—EDITOR, I. M. G.]

(Continued from previous page)

saline solution. The saline is poured off and a small quantity of hot but not boiling 70 per cent alcohol or 5 per cent formalin added. The worms will be found well extended and they may be kept indefinitely in whichever of the two fluids has been used for fixing them.

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The details of the working as carried out in the Civil Hospital, Sargodha, are given below. These instructions are hung up in the hospital office.

1. A nominal roll of the volunteers for blood transfusion with their case cards will be maintained in the operating theatre.

2. As soon as a case that needs transfusion arrives at the hospital, 2 to 5 c.cm. of blood will be withdrawn from a vein of the patient and kept for coagulation and separation of serum.

3. The assistant surgeon will then send for six volunteers from the list and inform the civil surgeon.

4. As soon as the serum is separated, it should be pipetted off in another clean test tube. If the serum is not very clear, it should be centrifugalized and kept in a clean test tube.

5. Prepare and keep the citrate solution ready (150 c.cm. of a 2 per cent solution in sterile distilled water).

6. On arrival of the volunteers, the surgeon should be called by telephone, if he is not already there.

7. The surgeon or the assistant surgeon will test the compatibility of the bloods.

8. The suitable donor will then be prepared for withdrawal of blood.

9. Special effort must be made so that no pain is given in the process of drawing the blood, and every courtesy must be shown to the donor.

10. Local anæsthetic (1 per cent novocaine) must be given.

11. The vein must not be dissected out. It may be preferable to puncture the skin over the vein with an old cataract knife as this will make the introduction of the needle easier. Pinch up the skin over the vein with a pair of forceps and then puncture the skin with the point of the knife.

(Keynes' needle with 6 inches rubber tubing attached to it and filled with citrate solution is used for the venepuncture).

12. After withdrawal of blood the donor will be sent home in a conveyance with an attendant.

It is not the object of this paper to go into the detail of the technique of transfusion. The simplest method for collection and transfusion is best suited for small hospitals and I find that Keynes' needles are the only special instruments necessary for the purpose. The needle, to which about 6 inches of rubber tubing is attached, is filled with citrate solution. The arm band of a sphygmomanometer is applied to the arm and distended to a pressure of 40 mm. of mercury which maintains enough pressure to keep the veins distended without causing any impairment to the arterial flow. After introduction of the needle into the vein the end of the rubber tube is put into a bottle containing the citrate solution, so that the blood drops straight into the solution. The bottle itself is

placed in a bowl containing warm water, and occasionally gently shaken.

In an outlying dispensary where no trained assistants and proper needles are available, the method of collection, as described below, may be used.

Before starting the operation the details are explained to the assistant, who may be only a compounder, and it is made certain that he has understood what he is expected to do.

Two or preferably three 20 c.cm. syringes are required. If 20 c.cm. syringes are not available 10 c.cm. syringes may be used. But the syringes must fit on to the same needle used for venepuncture.

150 c.cm. of 2 per cent citrate solution is prepared. 100 c.cm. of the solution is placed into the collecting bottle, and 50 c.cm. into a sterile gallipot.

Two bowls containing sterile normal saline solution are kept handy.

The donor's arm is prepared and a tourniquet is applied in such a way that the venous outflow is obstructed with as little impairment as possible to arterial flow.

The syringe and needle are filled with about 2 c.cm. of the citrate solution from the gallipot. The vein is punctured and blood withdrawn into the syringe in the ordinary way. When the syringe is full of blood it is detached from the needle and handed over to the compounder, who squirts it into the collecting bottle (kept in a bowl of warm water). The compounder, when he receives the syringe filled with blood, hands over the other clean syringe containing 2 c.cm. of citrate solution to the operator, who fixes it on to the needle in the vein and fills it with blood.

The compounder after he squirts the blood into the collecting bottle, cleanses the syringe in the first bowl of the saline and then in the second bowl, by drawing the plunger in and out. When it is thoroughly clean he draws into it about 2 c.cm. of citrate solution from the gallipot. The syringe is now ready for further collection of blood and he hands it over to the operator, when the latter takes off the syringe full of blood from the needle in the vein. The operator now fixes the clean syringe on to the needle in the vein and again fills the syringe. This goes on in rotation until the required amount of blood is obtained.

It is advisable to push a little citrate solution into the needle after collection of alternate syringes full. This will ensure that the needle will not be blocked by a clot. But before doing this the operator must satisfy himself that there is no clot already in the needle. If blood had been flowing out of the needle immediately before fixing the syringe, it would indicate that the needle was not blocked.

If the needle actually gets blocked, and this is not uncommon unless the work goes on quickly and smoothly, another puncture must

(Continued at foot of opposite page)



## ELECTROCARDIOGRAPHIC CHANGES IN BERI-BERI

By T. K. RAMAN, M.D., D.T.M. (Cal.)

(From the Department of Medicine, Medical College,  
and King George Hospital, Vizagapatam)

THERE were 20 cases of beri-beri in this series\*; all were males. The minimum age was 19 years and the maximum 40. All the cases were diagnosed clinically as beri-beri by the presence of oedema, cardiac disturbances, and peripheral neuritis. Oedema was present in all but one case at the time the electrocardiogram was taken. An electrocardiogram was taken only once in each case and the findings were as follows :—

1. *Rhythm*.—Four cases showed sinus tachycardia, one showed auricular fibrillation and the rest regular sinus rhythm.

2. *P wave or the auricular complex*.—One case showed prominent P in L 2; in two other cases P was prominent in L 2 and L 3; and in one case there was no P wave, due to auricular fibrillation.

3. *P-R interval or conduction time*.—Four cases showed diminution in the P-R interval; one case showed a varying interval from 0.04 to 0.12 second. Two cases showed an interval of 0.08 to 0.12 second; one case showed an interval of 0.08 to 0.1 second. In all the other cases P-R intervals were normal except in one case which showed auricular fibrillation.

4. *Ventricular complex*.—Four cases showed left axial deviation; all the others did not show any change. None showed any evidence of right axis deviation.

Q was prominent in L 3 in two cases. R was split in one case in L 3.

*T wave*.—In one case T was zero in L 1 and negative in L 2 and L 3. Three cases showed T positive in L 1 and L 2 and negative in L 3. The changes in T wave were seen without the administration of digitalis. Eight other cases showed slight prominence of T wave. It was broad spiked in two cases in L 1 and L 2.

\*The series consists of 512 patients and 852 electrocardiograms.

(Continued from previous page)

be made with a separate needle in the same or the other arm.

When the required amount of blood is collected, the bottle is kept in a bowl containing warm water until transfusion. Transfusion may be carried out by any of the approved methods. I use a long funnel, e.g., the barrel of an ordinary glass syringe, to which a rubber tube and an ordinary needle are attached. The funnel itself is kept wrapped with a double layer of lint soaked in warm water (to keep it warm) and this is changed as often as necessary.

*Amplitude*.—Two cases showed low voltage in all the three leads. One showed low voltage in L 3.

5. *Irregularities*.—One case showed auricular fibrillation with ventricular premature contractions in L 1 and L 2. Another case showed ventricular premature contraction in L 1 and nodal extra-systoles in L 3.

### Discussion

Kepler reported that the electrocardiogram was normal in beri-beri. Scott and Hermann state that there are no characteristic or pathognomonic electrocardiographic changes. They describe negative T waves in L 1 and L 3 with slight left ventricular preponderance. They are of opinion that the changes are due to definite myocardial changes. Aslmeier and Wenkebach showed that electrocardiograms in beri-beri showed nothing definitely abnormal. There is no abnormality in rhythm or conduction. There is slight tendency to right ventricular preponderance and in some cases P-R interval is shorter. Keefer (1930) opined that there are no characteristic changes in the electrocardiogram but there is some evidence of myocardial changes in a few cases. He observed that the rhythm was normal in all his cases except in one patient who had extra-systoles and sinus tachycardia. Right ventricular preponderance was present in two patients. There was low voltage in four patients. P-R interval varied from 0.13 to 0.2 of a second. T was negative in L 3 in five cases, and changes in T wave were observed without the use of digitalis.

Chopra, Chaudhuri and De (1937) analysed 50 cases of epidemic dropsy, a disease closely allied to beri-beri, and report on the electrocardiographic findings. They state that functional disorder of the heart is very common. Sinus tachycardia and sinus arrhythmia and extra-systoles sometimes occur. P-R interval was found abnormally short. P wave was prominent in some cases showing increased auricular activity. Auricular fibrillation was present in one case.

### Summary

The findings from an analysis of my 20 cases can be summarized as follows :—

- (1) Prominent P wave in three cases.
- (2) Definite decrease of P-R interval in four cases.
- (3) Abnormal ventricular complex in 12 cases :
  - (a) Prominent T in L 2 and L 3 or in all three leads.
  - (b) Evidence of myocardial changes as shown by—
    - (i) Negative T in L 2 and L 3.
    - (ii) Low voltage in all three leads in two cases and in lead 3 in one case.

(Continued at foot of next page)



The amount of tannic acid in an ordinary cup of tea infused in the usual way is shown below:—

*Tannin in Teas. (Hutchison.)*

Tea	Tannin as gallo-tannic acid per 150 c.c. of infusion	Grains per tea cup
Ceylon Pekoe .. ..	0.142	2.18
Lapsang Souchong ..	0.087	1.33
Fine Assam .. ..	0.080	1.23
Fine Moning .. ..	0.058	0.89

Six samples of Ceylon tea infused for five minutes showed 5.8 per cent tannic acid. Infused for ten minutes they showed 7.3 per cent. Infusions of over five minutes contain more free tannic acid. Sixty grains of black tea infused for five to ten minutes in a pint of boiling water will contain about 6 to 10 per cent of tannic acid. This is a suitable strength for application to burnt surfaces. Ceylon tea is better than other teas because of the higher percentage of tannic acid it contains.



Fig. 1.—Second and third-degree burns treated with a compress of tea leaves from the ward teapot. The burnt area was cleaned with ether and spirits twenty minutes after the injection of  $\frac{1}{4}$  gr. of morphia with atropine. Three layers of lint, covered with a moist layer of tea leaves, were used as a compress. Appearance on the ninth day: clumps of tea leaves left on the burnt area are seen as black patches. The area is completely covered with a new epidermis.

*Action of tannic acid and of tea*

Tannic acid is used in concentrations varying from  $2\frac{1}{2}$  per cent to 20 per cent. Tannic acid is strongly astringent and is mildly anæsthetic and slightly antiseptic in its action. It coagulates the damaged proteins. The scab which forms on the surface restrains excessive granulations and protects the ingrowing epidermis resulting in a supple scar. Tea acts in the same way.

*General remarks on treatment of burns*

The treatment of small and superficial burns can be carried out by any method. The application of cod-liver oil, carron oil, paraffin, ambrine, pieric acid, gentian violet or flavine lotion will all lead to healing. Even a dusting powder, zinc ointment, a lotion of 10 per cent sodium bicarbonate or Goulard's lotion is sufficient for the purpose. But the treatment of deep burns which are extensive is quite a different matter.

The treatment of a severe burn by any method has to take into account:—

(a) The primary collapse due to fright and pain.



Fig. 2.—Knees and legs burnt by caustic soda. Areas covered by epithelium as seen on the twelfth day. The two black patches on the left leg are the only raw ones left uncovered by epithelium. Magnesium sulphate compresses were used earlier to clear the infection. Patient discharged on fifteenth day.

(b) Primary shock with vasomotor paralysis.

(c) Secondary shock associated with diminution of blood volume and concentration of the blood.

(d) Toxæmia with absorption of damaged tissue proteins, adrenalin deficiency and destruction of adrenal cortex.

(e) Inflammation and sepsis with infection by secondary organisms especially hæmolytic streptococci.

(f) Healing with scarring and contractures.

*First-aid treatment of burns with tea*

As a first-aid measure shock has to be overcome after the fire has been put out. The patient is laid flat, blankets are used to warm him and preparation is made for application of an infusion of tea. A pot of tea is prepared by infusing six teaspoonfuls of black tea in six cupfuls of boiling water for ten minutes. Four layers of clean handkerchiefs or sheeting are soaked in the hot tea. As the tea is cooling the

## THE USE OF TEA IN THE TREATMENT OF BURNS

By M. V. P. PEIRIS, F.R.C.S. (Eng.)  
General Hospital, Colombo

### Introduction

THE tannic acid treatment developed during recent years has reduced the mortality of burns from 40 per cent to 4 per cent and scalds from 20 per cent to 1 per cent. Other substances, such as mercurochrome and gentian violet, which are used in the treatment of burns, have not produced equally satisfactory results; and these are still under trial. The success of the tannic acid treatment as a first-aid dressing and as the routine treatment of burns is due to :—

- The prevention of the absorption of the damaged tissues which are coagulated by tannic acid.
- The formation of a crust, which supports and protects the tissues beneath a burnt area.
- The avoidance of pain and worry associated with the daily dressing by the other methods of treatment.

The purpose of this article is to advocate the use of tea in the treatment of burns. Tea, as a first-aid treatment, is extremely handy. It is cheap. It is available at a moment's notice in the remotest village in Ceylon or in any other country. The preparation and application are simple; and even a child can render this first-aid treatment without delay, and thereby minimize the shock and the toxæmia of a severe burn. An infusion of tea contains the necessary tannic acid. As a first-aid measure tea is always there ready for use while tannic acid is not.

(Continued from previous page)

(4) Cardiac irregularities manifested are sinus tachycardia, auricular fibrillation and extra-systoles, both ventricular and nodal in origin.

One cannot definitely attribute the auricular fibrillation and extra-systoles to beri-beri, as it was not possible to follow up these cases. It is just possible that these cardiac irregularities were present before the onset of beri-beri and continued during the stay of the patients in hospital, or these might be co-existent conditions without any relation to beri-beri.

My thanks are due to Dr. G. Dinker Rau and Dr. P. Kutumbiah for the kind permission to utilize the clinical material, case records and electrocardiograms of patients admitted into hospital.

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### Notes on the composition of tea

The composition of tea according to Bannister is:—

	A typical black tea, per cent	A typical green tea, per cent
Water .. .. .	8.20	5.96
Caffeine .. .. .	3.24	2.33
Albumin (insoluble) .. .. .	17.20	16.83
(soluble) .. .. .	0.70	0.80
Alcoholic extract .. .. .	6.79	7.05
Dextrin .. .. .	..	0.50
Pectin and peptic acid .. .. .	2.60	3.22
* Tannic acid .. .. .	16.40	27.14
Chlorophyll and resin .. .. .	4.60	4.20
Cellulose .. .. .	34.00	25.90
Ash .. .. .	6.27	6.07

The chief ingredients of tea are caffeine and tannic acid. The proportions of tannic acid and caffeine in tea as given by Allen are as follows:—

	Tannic acid, per cent	Caffeine, per cent
Ceylon, whole leaf (Pekoe) ..	13.01	3.85
" broken leaf ..	12.31	4.03
Assam, whole leaf (Pekoe) ..	10.08	4.02
" broken leaf ..	11.33	4.02
Java Pekoe .. .. .	12.93	3.75
Kaisow red leaf .. .. .	11.35	3.41
Moning black leaf .. .. .	11.76	3.74
Moyune Gunpowder .. .. .	12.95	2.98
Natal Pekoe Souehong .. .. .	9.90	3.08

The amount of tannic acid extracted from different teas are as follows:—  
(Scott Tebb.)

Class of teas	Number of analyses	Per cent Extract	Per cent Alkaloid	Per cent Tannin
Indian ..	18	26.11	2.84	7.43
Ceylon ..	12	26.04	2.68	7.85
China ..	13	22.12	2.40	6.08

Ceylon and Indian teas are richer in tannic acid than China teas. Green tea is richer in tannic acid than black tea. In the process of infusion 25 per cent of the weight of the leaf go into solution in about five minutes. In the making of a cup of tea ( $\frac{1}{4}$  of a pt.), about  $\frac{1}{6}$  of an ounce of dried leaf is employed. The proportion of tannic acid extracted in the infusion varies directly with the time of infusion. On the other hand the proportion of caffeine varies but little.

The following table shows the amount of tannic acid and caffeine according to the time of infusion.

(420 c.cm. of boiling distilled water poured on 3½ grammes of black tea.) (Green.)

	Five minutes' infusion, per cent	Ten minutes' infusion, per cent	Twenty minutes' infusion, per cent	Forty minutes' infusion, per cent
Extract ..	21.7	25.3	26.8	28.1
Caffeine ..	1.1	1.3	1.16	..
Tannic acid ..	6.8	8.5	11.7	16.3

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burnt parts are exposed by cutting open the dresses piecemeal and the warm compresses are applied direct on the part. A light bandage is applied over it. The patient is given a cup or hot tea or coffee. If the patient is in pain two tablets of veramon or an injection of morphia are indicated. Such a sedative will minimize shock, and therefore is best given before local treatment is begun. The application of oily preparations interferes with the subsequent routine treatment with tannic acid. They are to be avoided. When the patient is out of the stage of collapse, he is removed to a hospital for the routine treatment.

#### *The routine treatment with tea*

This is carried out in the same way as with tannic acid. A fresh infusion of tea is prepared and an antiseptic such as acriflavine (1 in 1,000) or gentian violet (1 per cent) or perchloride of mercury (1 in 2,000) is added. The burnt area is thoroughly cleansed under the full effects of morphia or under a general anæsthetic. Blisters are cut away and the wound is cleaned well with ether and spirit. Six layers of gauze or four layers of lint are soaked in the warm tea and applied to the burn. A light bandage is applied on the top. The bandage is soaked with tea when it gets dry, during the first 24 hours. The dressing is left on for 12 to 14 days. The constitutional treatment is carried out in the usual way. Anti-tetanic serum is given on the first day. If at any time there is sepsis as evidenced by a rising temperature, rapid pulse, coated tongue, anorexia, etc., the dressings are re-applied after cleansing the wound thoroughly under an anæsthetic as before. Proseptasine or prontosil is given by the mouth or by injection as a prophylactic against sepsis. If the wounds are foul, hypertonic saline dressings or a magnesium sulphate compress for 24 hours will be useful before re-applying the tea. Subcutaneous or rectal saline, or intravenous 6 per cent gum saline is used to combat toxæmia. In the place of compresses, spraying with tea may be carried out every hour for 12 to 24 hours as in the case of tannic acid. An electric cradle will help the applications to dry. For the perineum, groin, axilla, face and neck spraying will be preferred because of the difficulty of keeping on the dressings.

The eyes must be carefully protected before such applications. The parts are placed in the best position to prevent subsequent contractures. An ointment of 1 part of zinc oxide, 2 parts of oil of eucalyptus and 8 parts of vaseline is used for ulcers. Skin grafting is necessary for the large ulcers of deep burns.

During the last six months twelve cases of burns were treated by me at the General Hospital, Colombo. Six were extensive third-degree burns. The early cases were treated with compresses of moist tea leaves remaining in the ward

tea-pot. In the later cases two or three layers of lint soaked in tea prepared in the ordinary way in the ward were used. The dressings were inspected every five or six days. When necessary the compresses were renewed. In two cases burnt with caustic soda, magnesium sulphate compresses were necessary after the first tea compresses because of septic infection. Most of the cases were infected to varying degrees on arrival in the ward. The burnt areas healed as rapidly with tea compresses as with tannic acid compresses.

There were no deaths. Case reports are outlined below.

#### *Case notes*

(1) A. A., male, 15 years. Second-degree burn of side of face, treated with tea leaf compress. First day temperature 100.6°F. Temperature normal after third day. Discharged on 9th day of healing.

(2) K. K. E., male, 15 years. Extensive burns of second and third degree on left leg and thigh. First day temperature 100.6°F. Dressed with tea leaf compresses. Temperature normal on 8th day. Healing, discharged on 10th day.

(3) A. V. A., male, 35 years. Infected burns of right hand and right shoulder. Admitted on 6th day with temperature 99.4°F. Dressed with tea leaf compresses. Temperature normal on 15th day. Discharged at patient's request, on the 21st day, with wounds healing.

(4) W., male, 16 years. Second-degree burns by boiling water of right lumbar region. Treated with tea compress. Admission, temperature 99°F. Discharged, fit for O. P. D. treatment on 3rd day.

(5) M. J., male, 28 years. Second-degree burn by boiling water on back of chest and abdomen. Admitted with temperature 100.4°F. Treated with tea spray. Temperature normal on 5th day. Discharged for O. P. D. treatment on 6th day.

(6) E. D. S. J., male, 25 years. Third-degree burns of front of chest and left upper arm. Temperature 102°F. on 3rd day. Treated with tea compress. Temperature normal on 12th day. Discharged on 15th day, wounds healing.

(7) W. P., male, 73 years. Second-degree burn of right thigh and knee. Temperature 100.6°F. on 4th day. Treated with tea leaf compress. Discharged on 7th day, healed.

(8) E. A. P., male, 24 years. Third-degree burn of thigh and right foot. Admitted on 4th day. Fifth day Temperature 100.4°F. Treated with tea compress. Discharged on the 15th day, healed.

(9) B. A. E., male, 40 years. Third-degree burn of large area of the back. Temperature 100°F. on 4th day. Treated with tea compress. Discharged on 9th day at patient's request. Wounds healing.

(10) V. P., male, 22 years. Third-degree burn of right knee and leg, by caustic soda. Temperature 102.2°F. on 4th day. Treated first with dilute acetic acid and with tea compress, then with magnesium sulphate compress and again with tea. Temperature normal on 9th day. Healing and discharged on 15th day.

(11) S. V. P., male, 29 years. Third-degree burns of fronts of both knees and upper halves of both legs by caustic soda. Temperature 101.2°F. on 4th day. Treated with dilute acetic acid and with tea compresses and magnesium sulphate compresses. Temperature normal on 8th day. Healing and discharged on 15th day.

(12) V. P., male, 15 years. Third-degree burns of left thigh and left leg. Temperature 103°F. on 2nd day. Treated with tea compress. Temperature normal on 6th day. Healed and discharged on 15th day.



## THE USE OF COD-LIVER OIL IN INFECTED WOUNDS

By B. CHATTERJEE, M.B., D.T.M. (Cal.), L.M. (Dub.)  
*Medical Officer, The Chargola Valley Medical Association, Dullabcherra, Sylhet, Assam*

SINCE the appearance of an editorial article in the *Gazette* of February 1937, regarding the use of cod-liver oil for dressing of surgical cases, I have tried it on more than one hundred cases, with uniformly good results. Some of the cases were cured in a very short time, and I think some of my results may be of interest.

(1) The most remarkable case was one of mauling by a tiger. The man—a tea-garden labourer—was very badly injured over his head and right forearm by a tiger. The wound on his head was a longitudinal one, about 5 inches in length, extending from an inch above the forehead to a little above the occipital protuberance. An 'S' shaped vertical wound, starting from a little above the right ear, met this longitudinal wound at its middle in such a way that two triangular flaps of scalp were hanging over his right ear, when he was admitted into the hospital. The skull was exposed over the greater part of the wound. He bled profusely and was in a state of shock when admitted. There were some smaller wounds on his forehead also. Another large gaping wound, nearly encircled the upper part of his right forearm, exposed the supinator muscles, the fibres of which were torn in places. Just below this wound there were four or five deep punctured wounds, probably caused by the tiger's teeth.

The man was attended to, within a very short time after the incident. The wounds were cleansed as thoroughly as possible. The scalp wounds were stitched up, hoping for the best. Anti-tetanic and antistreptococcal serums were injected, and all the wounds were dressed with gauze soaked in cod-liver oil. For the next three or four days, the man was in a bad condition. His temperature went up between 103° and 104°F., and he was somewhat toxic. But luckily from the fourth day he began to show signs of improvement, the temperature settled down to 99°F., and the extreme pain in the wounds, of which he had been complaining, was markedly less. From this day he improved steadily. The stitches were removed on the tenth day. The whole of the head wound and the other wounds healed by first intention, except a small patch over the middle of the head, which took about another ten days to heal. By the end of three weeks he was quite well, except that he was still weak and somewhat anæmic. He was treated for his general weakness for another two weeks, and by the fifth week, he was back at his usual work. It may be noted, that all his wounds were treated with nothing but cod-liver oil, after cleansing them with methylated spirit.

I have treated several tiger bite cases previously; several of them were cured, but none of them recovered so quickly, and without any complications, and I think all the credit is due to cod-liver oil.

(2) A case was of indolent ulcer, of more than six months' duration, on the outer side of the left foot, extending from the heel to the

middle of the foot. He was dressed with cod-liver oil only, and was completely cured within three weeks.

(3) A European gentleman suffered from a suppurating sebaceous cyst, about the size of a medium-sized orange, on the middle of his back. This was operated on under local anaesthesia. A large quantity of pus was drained out, the capsule was dissected out piecemeal as far as possible, but the cyst could not be shelled out as it was very adherent to the surrounding muscles. The cavity was packed with sterilized gauze soaked in cod-liver oil, which was also used in dressing the wound all through, and it was healed in three weeks. There was no sup-puration throughout the course of healing, and the cavity filled up from the bottom by granulation.

(4) A case of extensive cellulitis of the right hand and forearm was treated with cod-liver oil dressings after operation and was cured within an unexpectedly short time.

(5) Four cases of extensive burns were treated with cod-liver oil dressings with most gratifying results. This treatment seems to be better than picric acid and tannic acid treatment. The successive dressings were painless, healthy granulations formed very quickly (sometimes so quickly and profusely that they became exuberant, and had to be kept down by applications of copper sulphate), and skin appeared in patches all over the wounds, within a very short time.

(6) A very chronic and troublesome case of sycosis of the thighs, legs and forearms of a patient, becoming worse in the rainy season for the last six or seven years, was previously treated with many kinds of remedies and with stock and autovaccine. But none proved successful. Then he was treated with daily gentle massage of the infected areas with cod-liver oil, and now he is apparently cured. This is the first rainy season in the last six or seven years that he has been free from his trouble.

(7) A case of Naga sore also healed up miraculously. He had two typical sores, each about the size of a rupee, on the dorsum of his foot, about an inch above the roots of the toes. In spite of all kinds of local treatment, one of the sores gradually extended between the fourth and the fifth toes, and burrowed deeply at the root of the little toe, and it was feared that this toe might fall off, if the extension was not checked. At last we resorted to cod-liver oil treatment. The wounds responded marvellously and were healed up within two weeks, and he was fit for his usual work on the third week after this treatment was begun. At this time, I treated four more cases of large and multiple Naga sores with cod-liver oil, but the response was not so striking as in the case cited above. At present there are 21 cases of Naga sore under my treatment. Some of them are showing very

(Continued at foot of next page)

## INTERATRIAL SEPTAL DEFECT WITH MITRAL INSUFFICIENCY OF CONGENITAL ORIGIN

By P. KUTUMBIAH, B.A., M.D. (Madras);  
M.R.C.P. (London)

Physician, King George Hospital, Vizagapatam  
and

P. RAMACHANDRA RAO, M.B., B.S. (Madras),  
Ph.D. (London)

Pathologist, King George Hospital, Vizagapatam

MORTALITY due to uncomplicated congenital defects of the heart is comparatively infrequent. Cabot's analysis of 1,906 cardiac autopsies shows only seven cases of congenital defects, of which two were clinically recognized and in only one was the death solely due to the cardiac anomaly. Among the congenital cardiac disorders Muir and Brown (1934) consider that interventricular septal defects are the commonest. Varying grades of persistent foramen ovale appear also to be not infrequent. Seib (1934) observed patency of the foramen ovale in 17 per cent of all autopsies of his series. Roessler (1934) however was able to collect only sixty-two cases of interatrial septal defects, measuring one centimetre or more in diameter, from the literature of the last hundred years. Thus large interatrial septal defects appear to be sufficiently rare to

(Continued from previous page)

satisfactory improvement (7 of them have become fit within 10 to 23 days), but others are not responding as satisfactorily. To compare the efficacy of different drugs, I treated different sores with different things—phenol, copper sulphate, normal saline, etc.,—but my general impression is that the action of cod-liver oil is quicker than that of the other remedies.

(8) Four cases of otorrhœa (one complicated with mastoid abscess, which had to be operated on) were all cured within a very short time.

Another case of otorrhœa of both the ears, as a complication of typhoid fever, was satisfactorily cured by cod-liver oil drops.

(9) One case of badly lacerated wound of the hand, caused by a crushing machine, was treated with cod-liver oil, and it healed up without suppuration.

The remainder of my cases were ulcers and septic wounds on various parts of the body.

The peculiarities I have noticed about cod-liver oil treatment of wounds were—

(i) Checking of formation of pus in fresh wounds, and quick clearing away of pus in already septic wounds.

(ii) Rapid healing of ulcers, which often became

[Note.—This treatment of wounds with cod-liver oil results without complication in my practice and the same results are possible rarely allowed in such conditions.—Ed.]

warrant the reporting of the following case, which, besides the septal defect, showed other congenital valvular abnormalities:—

V. K., male, aged 20 years, was admitted into the King George Hospital on 2nd March, 1934, for extreme dyspnoea. Three months before admission, he first noticed breathlessness on slightest exertion. For one month he has been confined to bed, unable to lie on either side. On admission he showed normal development, moderate nourishment, ascitic distension of the abdomen, œdema of the lower extremities, distended veins in the left side of the neck, but no appreciable cyanosis, anæmia or clubbing of the fingers. The left side of the chest showed well-marked bulging and a diffuse pulsation in the 5th interspace, palpable as far out as the anterior axillary line. It was dull on percussion in the front, below the level of the second rib, but resonant over the back. The left cardiac boundary extended to the posterior axillary line in the 6th intercostal space. Thrills were absent. The resonance on the right side was impaired about the level of the 6th interspace. Auscultation revealed a systolic murmur heard in all areas and conducted to the axilla in the mitral area. An inconstant presystolic murmur was also sometimes recognizable. The pulse (80 per minute) was of low tension and irregularly irregular. The breathing was bronchial and hurried (respiration—48 per minute). The breath sounds were suppressed on the right side about the level of the 6th intercostal space. A few rhonchi and crepitations were heard over the left base. Spleen and liver could not be palpated on account of the ascites. Death supervened on the succeeding day before radiological and electrocardiographic investigations could be undertaken. A provisional diagnosis of a decompensated double mitral lesion of the heart was entered.

Autopsy disclosed the following findings:—

**Cardiac findings.**—The heart was globular in shape, massive in size and weighed 26 ounces. *In situ*, the organ lay more on the left side of the middle line than on the right, though the right side of the heart showed remarkable hypertrophy and dilatation, the right ventricle forming nearly its entire front and apex. A few patches of epicardial fibrosis were observed on the anterior surface of the right atrium. All chambers showed well-marked dilatation and hypertrophy—the right chambers more than those of the left. Though the right ventricular cavity had a maximum transverse circumference equal to that of the left ventricle (15 cm.), the former had a much longer axis, since it curved round the apex of the latter. Besides, the pulmonary conus was enormously dilated, the circumference of its cavity being 10.5 cm. The walls of both ventricles measured 1 cm. in thickness. The maximum circumference of the right atrial cavity was 17.2 cm. while that of the left chamber was only 11.0 cm. The right atrial wall showed hypertrophy and fasciculation more marked than that of the left, the maximum thickness being about 0.5 cm. The interatrial septum showed a large oval defect, 4 by 3 cm., with a sharp fibrous margin in its anterior and lower part. A fibrous ledge, about 1 cm. wide, separated the a.-v. ring from the inferior margin of this defect. There was no evidence of a foramen ovale in the dorsal part of the septum. The atrioventricular orifices were of normal size. The valves of these orifices showed a varying degree of fibrosis. The posterior cusp of the mitral valve showed more marked sclerosis than the others, was abnormally short (maximum width 1.2 cm.), curled downwards and had a somewhat rounded verrucose margin with short yet moderately thin chordae tendineae (plate XXVI, figure 1). The anterior cusp, though somewhat opaque white and fibrous, was normal in size (maximum width 3.5 cm.) and appearance. No adhesions were present between the margin of the two cusps or between the chordae tendineae. The tricuspid valves had each a maximum width of 2 cm. The aorta was hypoplastic, lumen measuring only 5.7 cm. in circumference one inch above the ring. The valves were normal. The pulmonary orifice was much dilated, measuring 8.6 cm. in





Fig. 1.

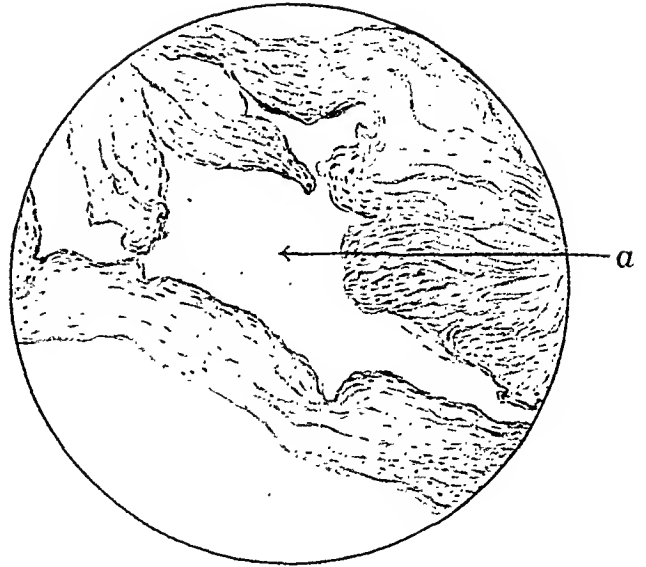


Fig. 4.

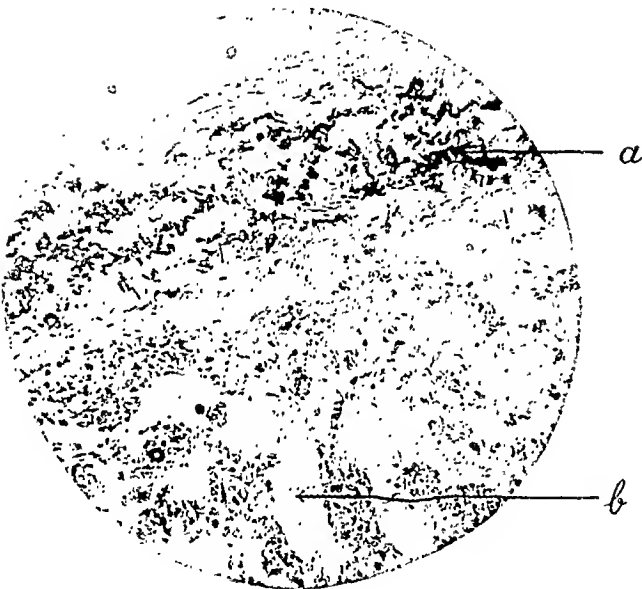


Fig. 2.



Fig. 5.

Fig. 1.—Photograph of the heart showing the large interatrial septal defect.

Fig. 2.—Photomicrograph of the right atrial wall showing—

- (a) the cluster of calcifying fibroblasts in the thickened subendocardial connective tissue;
- (b) oedematous distension of the interstitial lymph spaces in the myocardium.

(E. Leitz apochromat. objective 8 mm. periplanat. Eye-piece 4 mm.)

Fig. 3.—Drawn from a low-power photomicrograph a section of the septal cusp of the mitral valve—

- (a) nodular fibrous swelling a little above margin of the valve.
- (b) myocardium.

(E. Leitz achromat. objective 22 mm. periplanat. Eye-piece 4 mm.)

Fig. 4.—Drawn from a photomicrograph of the portion of one of the thickened tricuspid valves—

- (a) a dilated tortuous lymphatic.

(E. Leitz apochromat. objective 8 mm. periplanat. Eye-piece 4 mm.)

Fig. 5.—Photograph of the liver showing the characteristic type of cirrhosis.

Fig. 3

circumference. The pulmonary artery and its main branches were also markedly dilated. The lumen of the artery measured 7 cm. and that of its left branch 6.3 cm. in circumference and the intima was free from atheromatous change. The cusps of the pulmonary orifice were unequal in size, the posterior cusp being larger in size than either of the two anterior cusps. The right branch appeared to arise at a slightly higher level from the main artery than the left branch. The opening of the coronary sinus was also much dilated and measured about 1 cm. in diameter. The myocardium was firm, friable and like bacon in appearance.

Microscopically there was no evidence of active inflammation in any part of the heart except the left atrial epicardium where a few scattered round cells were seen. The myocardium showed general cloudy swelling, patchy fatty degeneration of the muscle fibres (particularly under the endocardium), passive congestion of the vessels and oedematous distension of the interstitial spaces. Hypertrophic stretching of the cardiac fibres with flattening of their nuclei was best seen in the right atrial myocardium, where also the interstitial oedema was most pronounced. The mural endocardium of both atria showed subendocardial loose oedematous sclerosis, particularly marked near the valvular rings. A few clusters of shrunken acidifying fibroblasts with hyaline swelling of the interstitial collagen fibres were present in the subendocardial fibrous tissue of the right atrium (plate XXVI, figure 2). The a-v. valves and their rings showed a considerable degree of non-deforming loose sclerosis. Both the auricular and ventricular layers of the valves showed swelling, which appeared to be more the result of a non-inflammatory oedematous infiltration of the collagenous and elastic fibres than a proliferative fibrosis of inflammatory origin. The tip of the posterior cusp of the mitral valve showed a well-marked nodular swelling of its auricular layer (plate XXVI, figure 3). Dilated lymphatic vessels were observed in the region of the valvular rings and in the centre of the thickened valves (plate XXVI, figure 4). Both the valves and their rings were completely free from any inflammatory infiltration.

*Other findings.*—Generalized oedema, flat chest with precordial bulging, clear fluid in all serous cavities, congestion and ulceration of left faucial tonsil, congestion and hyperplasia of the lingual tonsil, congestion and enlargement of the tracheo-bronchial lymph glands, passive congestion of all viscera, a tuberculous scar with a caseous centre in the upper lobe of the left lung. Slight enlargement of the spleen (12 oz.) and well-marked nodular chronic congestive cirrhosis of the liver (plate XXVI, figure 5) were also present.

[*Note.*—The measurements given above were taken from the formalin-fixed specimen.]

## DISCUSSION

*Nature of the lesion.*—In the case under report, the large defect in the anterior and inferior part of the interatrial septum, which did not reach down to the radix of the inter-ventricular septum, in the absence of any evidence of the development of a foramen ovale in the upper and dorsal part of the septum is evidently a result of incomplete union between the septum superius and septum intermedium, as in the third class of defects noted in Costa's classification. Clinically the case comes under the 'cyanosed tardive' group of congenital cardiac defects mentioned by Abbot.

*Pathogenesis.*—The genesis of septal defects has been often traced to an increased tension in the left auricle owing to either a congenital mitral stenosis or hypoplastic aorta. In this

instance the aortic hypoplasia was inconsequential and, instead of a mitral stenosis, the imperfect development and degenerative sclerosis of the septal cusp had actually led to a certain degree of incompetency of the mitral orifice. In a similar case reported by Roesler (1934), the septal defect has been considered by him as probably the result of a primary agenesis independent of valvular lesion. In this case the defective development of the septal cusp of the mitral valve and the inequality in the size of the semilunar cusp of the pulmonary valve are to be regarded only as additional independent congenital deformities. Markham and also Abbot have pointed out the invariable or frequent presence of such deformities in other parts of the heart along with interatrial septal defects.

*Age.*—Though the majority of Cabot's series of congenital cardiac defectives died young (7 to 30 years), instances of comparatively large interatrial communications when combined with mitral stenosis, permitting active and useful life to a fairly advanced age, are not rare. Firket's case lived 74 years. Lutembacher's case lived 61 years and Abbot and Kaufmann's case 64 years. But the few cases on record, of atrial septal defects combined with mitral incompetency, appear to have terminated early, as in our case. Roesler's case survived only 14 years.

*Effects of the defect.*—The occurrence in these cases of a left to right shunt of the blood through the defect has been thoroughly discussed by Roesler (1934) in his exhaustive review of the subject. This shunt occurs irrespective of the presence or absence of the mitral lesions (Gibson and Roos, 1935). The anatomical changes in the heart resulting from this shunt were well illustrated in the case reported above. The globular outline, the hypertrophy and dilatation of the right atrium and ventricle—the heart apex being formed by the latter—the dilatation of the pulmonary conus and artery and the comparative hypoplasia of the aorta, all reflect the equalization of the pressure in the two sides of the heart, and the increase in the output of the right side with a corresponding diminution in that of the left side brought on by the shunt. Peacock has pointed out the excess of dilatation over the hypertrophy in the right side, in instances of large patency of the foramen ovale. Measurements in our case showed an equality in the myocardial thickness in the walls of the two ventricles. Enlargement of the left atrium had also been noted in Roesler's case of septal defects associated with mitral insufficiency and, as in our case, was evidently the result of a systolic regurgitation into it through the incompetent mitral orifice. To the latter may also be attributed, the systolic murmur conducted to the axilla seen in our case.

*Specific murmurs.*—Systolic murmurs best heard over the 3rd interspace (Abbot), inconstant presystolic, early systolic or late diastolic murmurs of varying rhythm, localized at

the 4th left interspace have been described in instances of patent foramen ovale or septal defects. These with a weak aortic or strong pulmonary sound are also said to be characteristic. But the first-mentioned finding has been noted also in interventricular septal defects by Muir and Brown and the belief that interatrial septal defects can exist without giving rise to murmurs has many adherents. Potain contended that murmurs when present in cases of septal defects are always of extraneous origin. Roesler suggested that systolic murmurs extending into diastole or early diastolic murmurs are more likely to arise only in instances of smaller interatrial openings. Even this has been denied by Miller (1936). As the case under report came under observation only in the terminal stages of decompensation, the findings in this case offer no answer to the question of existence or otherwise of murmurs specific to septal defects.

**Cyanosis.**—In large interatrial septal defects cyanosis fails to appear until almost the end. On the other hand, cyanosis has been stressed (Miller 1936) as diagnostic of patency of the foramen ovale. This is easily understood when it is remembered that in the latter the valve-like action of the imperfectly-developed septum secundum, which permits only a one-way right-to-left flow whenever the right atrial pressure rises above that of the left atrium, is absent in the former. In large interatrial septal defects cyanosis sets in only as a terminal manifestation of a failing compensation and increasing right atrial pressure. The failure of even this terminal cyanosis in Cramer and Prommel's case of septal defect with mitral stenosis was attributed to an earlier onset of right atrial systole. In our case, besides the onset of fibrillation of the right atrium, the systolic regurgitation into the left atrium might have tended to prevent the terminal reversal of the shunt, by keeping up the pressure inside the left atrium. The systolic venous pulse of mitral regurgitation is however abolished in cases of interatrial communication when the over-full right atrium begins to fibrillate. The pulsatory phenomena, such as systolic lower central precordial propulsion, systolic epigastric and aortic pulsation and thrill, usually mentioned as present in interatrial septal defects, apparently disappear as in this case in the final stage of decompensation.

**Endocardial sclerosis.**—The degenerative non-deforming sub-endocardial sclerosis in the atria and auriculo-ventricular valves and even the nodular thickening of the margins of the septal cusp of the mitral valve appear to have resulted from the increased stress and strain in the atria, aggravated by the subendocardial oedema due to coronary venous congestion. It is interesting to note that the loose fibrous swelling of the subendocardial connective tissue was maximum near the auriculo-ventricular rings and progressively diminished further away from this area. Shoval and Gross have

recently explained the non-deforming sclerosis of the valves and endocardium as the result of an individual predisposition to collagen involution, lipoid and calcareous deposition, aggravated by increased stress and strain. The incidence of varying degrees of a non-deforming sclerosis of the auriculo-ventricular valves and atrial endocardium is not at all rare in our autopsy material. The absence of Aschoff's nodes, vegetations, adhesions between margins of the cusps or chordae tendineae in this instance, discounts the changes of an inflammatory origin of the subendocardial fibrosis. Abbott has emphasized this rarity of subacute endocardial lesions, either at the defect or in the valves in cases of interatrial defects, unlike interventricular septal defects. Roesler as well as Gibson and Roos, however, come to the conclusion that the prognosis in interatrial septal defects is not materially altered by the presence or absence of an endocarditis. The terminal auricular fibrillation in these instances must be presumed to be of non-rheumatic origin.

**Cause of the decompensation.**—In interatrial septal defects the lesion is stationary, but the demand on the output of the heart due to growth and increased activity is progressive. Eventually a stage is reached, of an 'acquired progressive hydraulic disturbance', when the already overloaded right side of the heart fails with the usual signs of a right heart failure.

### Summary

A case of large interatrial septal defect, with mitral insufficiency due to a disgenetic hypoplasia of the septal cusp, with the following characteristic findings is reported:—

- (1) Evidence of a long-standing left to right shunt in the circulation—even in the absence of a stenosis of the mitral valve—such as the remarkable hypertrophy and dilatation of the right side of the heart including the pulmonary conus and artery;
- (2) concomitant developmental inequality in the size of the cusps of the pulmonary and mitral valves and consequent mitral incompetency, systolic murmur, hypertrophy and dilatation of the left ventricle;
- (3) hypoplasia of the aorta;
- (4) terminal fibrillation of the right auricle which also showed the maximum histological evidence of strain and exhaustion, such as myocardial hypertrophy and oedema;
- (5) chronic congestive cirrhosis of the liver apparently due to the increase in the pressure in the right atrium as a result of the shunt;
- (6) comparative soundness of the pulmonary circulation till the end, as shown by the total absence of a delayed cyanosis usually seen in such cases, a quiescent healing tuberculous focus in the left lung, and by the absence of any atheromatous change in the pulmonary vessels;

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# EXPERIMENTAL INVESTIGATION INTO THE DURATION OF TOLERANCE TO RE-INFECTION IN MONKEY MALARIA

By B. M. DAS GUPTA

(From the Department of Protozoology, School of Tropical Medicine, Calcutta)

## Résumé of previous work

KNOWLES (1934) made the following observations in regard to the development of tolerance in monkey malaria. Between November 1932 and August 1933, a *Silenus rhesus* monkey was given four injections with monkey plasmodium, treated each time with small doses of quinine, and developed a chronic infection, which apparently cleared up. On 7th August, 1933, it was given a 5th injection of infected blood, with no response. On 30th August, 1933, it was given a 6th injection (one-sixth of this amount is usually needed to produce a severe infection in a normal animal). There was no response. On 14th October, 1933, a still larger dose was given. After an incubation period of 11 days, the parasites appeared in the peripheral blood, but the rate of multiplication was much slower than in a monkey with a primary infection.

Mulligan and Sinton (1933) carried out extensive valuable experiments to determine whether chronic or latent infections with certain strains of monkey plasmodia would confer any tolerance to superinfection with the same strains. For experiments with *Plasmodium knowlesi* they selected *S. rhesus* monkeys which were all suffering from established infections of considerable duration (64 to 343 days) at the time of superinfection. All these animals, except one, had suffered from an initial acute attack of malaria, the course of which had been arrested by anti-malarial drugs. In every case the acute attack had been followed by one or more relapses. Eventually, the infection became chronic or latent. At this stage the parasites were either absent or present in small numbers in the peripheral blood over long periods. At the time of superinfection, parasites, if present, were to be

seen only in scanty numbers. From the results of their extensive studies they have concluded that superinfection with a homologous strain of either *P. inui* var. *cynomolgi* or *P. knowlesi* failed to produce a re-infection in *S. rhesus*, or, if re-infection was produced, its effects were so mild that it could only be recognized by a very slight transient increase in the number of parasites in the peripheral blood. Having failed to produce re-infection in monkeys suffering from chronic infection with homologous strains of monkey plasmodia, they decided to study the effects of superinfection with heterologous strains. Accordingly, they selected 13 monkeys with chronic low-grade or latent infections. The dosage of infected blood and the route of administration were the same as in the previous work. The series of experiments with heterologous strains suggested that a chronic infection with one strain of *P. knowlesi* did not confer an effective immunity against the occurrence of an acute malarial attack following superinfection with different strains of the same parasite.

## Present investigation

To ascertain up to what length of time tolerance acquired by the monkey to re-infection with the same strain of *P. knowlesi* persists, experiments were carried out on the two monkeys one of which was infected with *P. knowlesi* in August 1932 and the other in February 1933, and during 1933 and 1934 we superinfected them with the same strain of the parasite on several occasions. These two monkeys along with two others have been kept in the protozoological laboratory for a long time as they harboured balantidium and other intestinal protozoa, which are of great value for teaching purposes.

## MONKEY I

### History of primary infection and subsequent inoculations

In December 1932 it was inoculated with 0.25 c.cm. of blood from a *S. rhesus* heavily infected with *P. knowlesi*. The parasites appeared in the blood on the 4th day of inoculation. On the 7th day the parasite count was very high (more than 60 per cent red cells were infected). Quinine (1½ grains) was given on four consecutive days. The parasites disappeared, but the blood picture was one of severe anæmia (red cells — 1,800,000 per c.mm., normoblasts +, Howell-Jolly bodies +, anisocytosis +, polychromatophilia +). This anæmic condition of the blood soon passed off. Relapse occurred on the 32nd day of inoculation. Multiplication of the parasite was controlled by the injection of one dose of 2 grains of quinine. Very scanty parasites were detected in the blood examined a month later. Henceforward the parasites appeared, disappeared and re-appeared in very scanty numbers till June 1933. The monkey was now

(Continued from previous page)

TABLE  
'Universal' or mixed indicator

pH	Colour	pH	Colour
1.0	Red	7.0	Greenish yellow
2.0	Pink	8.0	Green
3.0	Orange pink	9.0	Greenish blue
4.0	Orange	10.0	Blue
5.0	Orange yellow	11.0	Violet
6.0	Yellow	12.0	Purple

## REFERENCE

Clark, W. M. (1928). *The Determination of Hydrogen Ions*. Baillière, Tindall and Cox, London.

inoculated with the same strain of *P. knowlesi*. (We had then only one strain of *P. knowlesi*, isolated from a *S. irus* which was wrongly identified as a species of the genus *Cercopithecus*.) The blood films of this monkey were then examined every Saturday for two months. Scanty parasites were seen on three occasions only. In October 1933 it was given another injection with *P. knowlesi*, but no increase in the number of parasites was ever noticed in consequence. In March 1934 it was inoculated for the 4th time with the same parasite with the result that on the 13th day of inoculation there was an appreciable increase in the number of parasites in the monkey's blood, but they gradually decreased without any treatment. From October 1934 to December 1935 the blood of this animal was not examined nor was the animal used for any experimental work owing to the writer's absence from India. On his return the writer examined the animal for intestinal protozoa, particularly balantidium, and for plasmodial infection. The intestinal protozoal fauna was found to be nearly the same, but no plasmodial parasites were seen. To ensure that the monkey was absolutely free from plasmodial infection, its blood was examined daily for two months and once a week for the next 14 months. On no occasion were the parasites found. Then 5 c.cm. of blood were taken from the animal and injected into a young *S. rhesus* without any response. It was, therefore, reasonable to believe that the animal was cured of *P. knowlesi* infection. Now 0.25 c.cm. of blood from a rhesus monkey heavily infected with *P. knowlesi* (the same strain as used in the previous inoculations) was injected into this animal. On the 4th day the parasites were detected in the monkey's blood. The parasites multiplied very vigorously and on the 4th day of their first appearance in the blood, i.e., on the 8th day of inoculation, nearly 80 per cent of the monkey's red cells were parasitized and the animal died.

### Summary

From December 1932 to March 1934 the monkey was inoculated four times with *P. knowlesi*. The initial attack ran an acute course which was interrupted by quinine treatment. There was a relapse following the initial infection, but this was readily arrested by a single dose of quinine (1½ grains intramuscularly). As a result of three subsequent inoculations no marked increase in the number of parasites in the monkey's blood was observed. After the 4th injection, however, there was a distinct increase in the parasite count. But no acute attack developed and the parasites gradually diminished without any treatment. The monkey's blood was not examined from October 1934 to December 1935. After this period the blood was systematically examined till July

1936, but no parasites were ever found. As a further proof that the monkey was now free from infection with *P. knowlesi* 5 c.cm. of its blood were injected into a young *S. rhesus*, but there was no response. At this stage the monkey was inoculated with the same strain of *P. knowlesi*; this resulted in a very severe infection and death of the monkey.

### MONKEY II

#### History of primary infection and subsequent inoculations

In February 1933 this animal was infected with *P. knowlesi*. On the 8th day of inoculation it showed a very large number of parasites (52 per cent red cells parasitized and many of these showed multiple infection). The animal was treated with 0.05 grammes atebirin given intramuscularly for four days; 19 days after the treatment had stopped there occurred a severe relapse which was controlled by a course of quinine (1½ grains daily for four days). Blood examined on 3rd May, 1933, showed very scanty parasites. On this date it was re-inoculated with *P. knowlesi*. From the 7th day of inoculation the monkey's blood was examined daily for two weeks and no appreciable increase in the number of parasites was found and the animal remained quite active. From 4th June to 8th August, 1933, the blood was examined 42 times and during this period scanty parasites could be detected only on 9 occasions, the last positive finding being on 8th August, 1933. On the 9th August, it was injected again with *P. knowlesi*. The blood was not, however, examined till 9th October, 1933, when no parasite was seen. The blood was again examined for plasmodial infection on 1st, 5th, 8th and 9th November, 1933, but only very scanty infection was detected on the last two days. On 10th November, 1933, the monkey was inoculated for the 4th time. A week after the injection the blood was examined and a fair number of parasites was found. On 2nd January, 1934, the monkey's blood showed no parasites. It was re-inoculated with a massive dose (3 c.cm. of blood from a heavily parasitized monkey). A good number of parasites was noted on the 11th day of inoculation but this gradually diminished. On 18th June, 1934, the blood of the monkey was examined but no parasites were found. As in the case of monkey I, the blood of this animal was also examined systematically for more than a year, from January 1936. All these examinations proved negative. In February 1937 it was inoculated with 0.25 c.cm. of blood from a monkey heavily infected with the same strain of *P. knowlesi* as used for the primary inoculation. Severe infection resulted. Had it not been checked in time, the infection would have certainly proved fatal.

*Summary.*—As a result of the primary inoculation, a very severe attack developed as usual and it was arrested with a course of atebirin.

(Continued at foot of next page)

0 1 2 3 4 5 6 7 8 9 10 11 12 13

Methyl Violet 1

Thymol Blue

Methyl Violet II

Methyl Orange

Bromocresol Green

Bromocresol Purple

Bromothymol Blue

Phenol Red

Cresol Red

Thymol Blue (alkaline)

Thymolphthalein

lizarin Yellow R

Universal Indicator

Tropæolin O

2

4

5

6

7

8

9

10

11

12

13

Colour chart for the selection of an indicator.

H. M. Roy. 1937.

## A COLOUR CHART FOR THE DETERMINATION OF HYDROGEN-ION CONCENTRATION

By C. L. PASRICHA  
MAJOR, I.M.S.

and

SUDHAMOY GHOSH, D.Sc., F.I.C.

(From the Departments of Bacteriology and Chemistry,  
School of Tropical Medicine, Calcutta)

The study and the control of hydrogen-ion concentration is of fundamental importance in many branches of research work and is of great value in industrial processes, where minute changes in the reaction may have considerable effect on the quality of certain products. With the introduction of modern colorimetric methods the determination of pH value has become a routine procedure in many laboratories and because of the comparative ease with which the estimations can be made the actual determination is frequently carried out by laboratory assistants or technicians. It is only when exact methods must be employed and the advice of an experienced physical chemist sought. The colorimetric methods are invaluable when a large number of estimations has to be made and only approximations are needed, for example, in the preparation of media for bacteriological or other work.

In the colorimetric methods discs are commonly used, which show the change of colour of

indicators between certain pH values. Individual investigators are familiar with the range of colour at given pH values of the reagents they use in their particular work, but in every laboratory there are circumstances when it becomes necessary to determine the pH values at a range different from the one at which the worker is familiar, and this necessitates the selection of other indicators. Although there are many textbooks in which long lists of indicators are tabulated, the selection of a suitable indicator is somewhat difficult except for experienced chemists. The colour chart in that excellent textbook by Clark (1928) shows the shades of colour of certain sulphonphthalein indicators at differences of 0.2 pH values. The range is from a pH of 1.2 to 9.6 with a gap from 2.8 to 3.1.

In order to overcome difficulties in the ready selection of indicators for general purposes we have chosen thirteen indicators for which standard coloured discs (as, for example, the Hellige Comparator) are available. These indicators cover a range from 0.2 to 12.8 and are so arranged in the chart that a ready selection of an indicator for a particular pH range can be made. The colours at given pH values of a 'universal' or mixed indicator have also been shown in the chart but no attempt has been made to indicate the variations in the shades of the colours. It must be stressed that in no reproduction can the intensity or the quality of the colour be exactly depicted. This colour chart is not designed to take the place of the standard solutions or even the standard discs but has been prepared to serve as a guide for the selection of indicators and to show the gradations of colour that occur at different pH values. Further, it may be necessary to select other indicators for special work, but for all ordinary types of work the indicators given in this chart will be found useful.

TABLE

List of indicators used in the chart

Indicator	pH range	Colour
1. Methyl violet I	0.2 to 1.8	Yellow to blue.
2. Thymol blue (acid)	1.2 to 2.8	Red to yellow.
3. Methyl violet II	1.8 to 3.2	Blue to violet.
4. Methyl orange ..	2.8 to 4.4	Red to yellow.
5. Bromo cresol green	4.0 to 5.6	Yellow to blue.
6. Bromo cresol purple	5.2 to 6.8	Yellow to purple.
7. Phenol red ..	6.0 to 7.6	Yellow to blue.
8. Cresol red ..	6.8 to 8.4	Yellow to red.
9. Thymol blue (alkaline).	7.2 to 8.8	Yellow to red.
10. Thymolphthalein	8.0 to 9.6	Yellow to blue.
11. Alizarin yellow R	9.4 to 10.6	Light blue to blue.
12. Tropaeolin O ..	10.4 to 12.0	Brown to dark brown.
13. Tropaeolin O ..	11.2 to 12.8	Yellow to brown.

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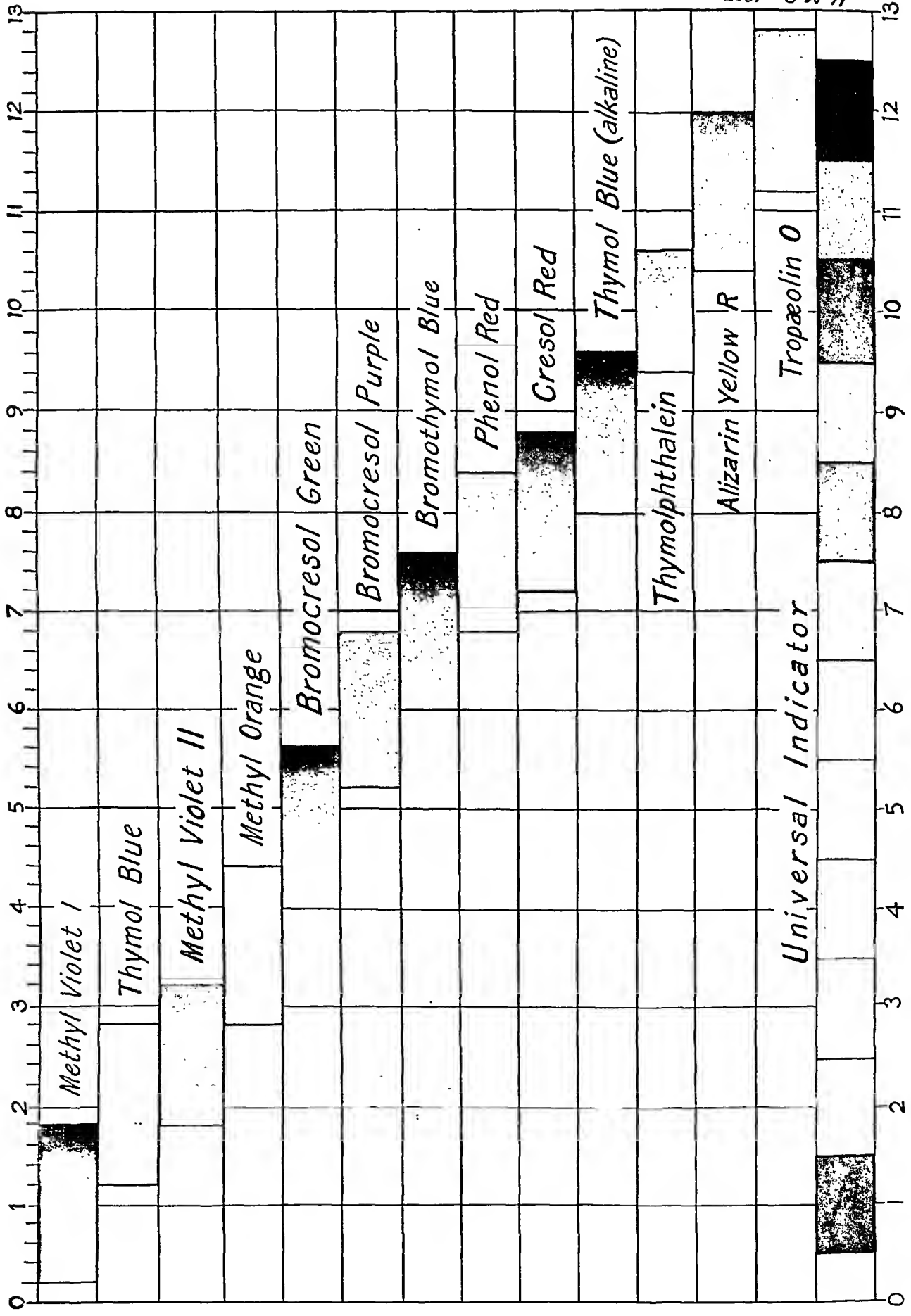
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(7) non-inflammatory degenerative sclerotic thickening of imperfectly devascularized auriculo-ventricular valves and of the subendocardial connective tissue of the atria in which a tendency to metaplastic transformation of the connective tissue cells into osteoblasts were observable; and lastly

(8) total absence clinically of signs such as thrills, rough bruits, cyanosis, clubbing of fingers, arrested growth, suggestive of congenital abnormalities of the heart and histologically of any of the evidences of inflammation either rheumatic or otherwise in any part of the heart.

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H. M. Roy. 1937.

Colour chart for the selection of an indicator.



# A COLOUR CHART FOR THE DETERMINATION OF HYDROGEN-ION CONCENTRATION

By C. L. PASRICHA

MAJOR, I.M.S.

and

SUDHAMOY GHOSH, D.Sc., F.I.C.

(From the Departments of Bacteriology and Chemistry,  
School of Tropical Medicine, Calcutta)

THE study and the control of hydrogen-ion concentration is of fundamental importance in many branches of research work and is of great value in industrial processes, where minute changes in the reaction may have considerable effect on the quality of certain products. With the introduction of modern colorimetric methods the determination of pH value has become a routine procedure in many laboratories and because of the comparative ease with which the estimations can be made the actual determination is frequently carried out by laboratory assistants or technicians. It is only when exact determinations are required that electrometric methods must be employed and the advice of an experienced physical chemist sought. The colorimetric methods are invaluable when a large number of estimations has to be made and only approximations are needed, for example, in the preparation of media for haeteriological or other work.

In the colorimetric methods discs are commonly used, which show the change of colour of

indicators between certain pH values. Individual investigators are familiar with the range of colour at given pH values of the reagents they use in their particular work, but in every laboratory there are circumstances when it becomes necessary to determine the pH values at a range different from the one at which the worker is familiar, and this necessitates the selection of other indicators. Although there are many textbooks in which long lists of indicators are tabulated, the selection of a suitable indicator is somewhat difficult except for experienced chemists. The colour chart in that excellent textbook by Clark (1928) shows the shades of colour of certain sulphonphthalein indicators at differences of 0.2 pH values. The range is from a pH of 1.2 to 9.6 with a gap from 2.8 to 3.1.

In order to overcome difficulties in the ready selection of indicators for general purposes we have chosen thirteen indicators for which standard coloured discs (as, for example, the Hellige Comparator) are available. These indicators cover a range from 0.2 to 12.8 and are so arranged in the chart that a ready selection of an indicator for a particular pH range can be made. The colours at given pH values of a 'universal' or mixed indicator have also been shown in the chart but no attempt has been made to indicate the variations in the shades of the colours. It must be stressed that in no reproduction can the intensity or the quality of the colour be exactly depicted. This colour chart is not designed to take the place of the standard solutions or even the standard discs but has been prepared to serve as a guide for the selection of indicators and to show the gradations of colour that occur at different pH values. Further, it may be necessary to select other indicators for special work, but for all ordinary types of work the indicators given in this chart will be found useful.

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(7) non-inflammatory degenerative sclerotic thickening of imperfectly devascularized auriculo-ventricular valves and of the subendocardial connective tissue of the atria in which a tendency to metaplastic transformation of the connective tissue cells into osteoblasts were observable; and lastly

(8) total absence clinically of signs such as thrills, rough bruits, cyanosis, clubbing of fingers, arrested growth, suggestive of congenital abnormalities of the heart and histologically of any of the evidences of inflammation either rheumatic or otherwise in any part of the heart.

## REFERENCES

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TABLE

List of indicators used in the chart

Indicator	pH range	Colour
1. Methyl violet I	0.2 to 1.8	Yellow to blue.
2. Thymol blue (acid)	1.2 to 2.8	Red to yellow.
3. Methyl violet II	1.8 to 3.2	Blue to violet.
4. Methyl orange ..	2.8 to 4.4	Red to yellow.
5. Bromo cresol green	4.0 to 5.6	Yellow to blue.
6. Bromo cresol purple	5.2 to 6.8	Yellow to purple.
7. Bromo thymol blue	6.0 to 7.6	Yellow to blue.
8. Phenol red ..	6.8 to 8.4	Yellow to red.
9. Cresol red ..	7.2 to 8.8	Yellow to red..
10. Thymol blue (alkaline).	8.0 to 9.6	Yellow to blue.
11. Thymolphthalein	9.4 to 10.6	Light blue to blue.
12. Alizarin yellow R	10.4 to 12.0	Brown to dark brown.
13. Tropaeolin O ..	11.2 to 12.8	Yellow to brown..

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# EXPERIMENTAL INVESTIGATION INTO THE DURATION OF TOLERANCE TO RE-INFECTION IN MONKEY MALARIA

By B. M. DAS GUPTA

(From the Department of Protozoology, School of Tropical Medicine, Calcutta)

## Résumé of previous work

KNOWLES (1934) made the following observations in regard to the development of tolerance in monkey malaria. Between November 1932 and August 1933, a *Silenus rhesus* monkey was given four injections with monkey plasmodium, treated each time with small doses of quinine, and developed a chronic infection, which apparently cleared up. On 7th August, 1933, it was given a 5th injection of infected blood, with no response. On 30th August, 1933, it was given a 6th injection (one-sixth of this amount is usually needed to produce a severe infection in a normal animal). There was no response. On 14th October, 1933, a still larger dose was given. After an incubation period of 11 days, the parasites appeared in the peripheral blood, but the rate of multiplication was much slower than in a monkey with a primary infection.

Mulligan and Sinton (1933) carried out extensive valuable experiments to determine whether chronic or latent infections with certain strains of monkey plasmodia would confer any tolerance to superinfection with the same strains. For experiments with *Plasmodium knowlesi* they selected *S. rhesus* monkeys which were all suffering from established infections of considerable duration (64 to 343 days) at the time of superinfection. All these animals, except one, had suffered from an initial acute attack of malaria, the course of which had been arrested by anti-malarial drugs. In every case the acute attack had been followed by one or more relapses. Eventually, the infection became chronic or latent. At this stage the parasites were either absent or present in small numbers in the peripheral blood over long periods. At the time of superinfection, parasites, if present, were to be

seen only in scanty numbers. From the results of their extensive studies they have concluded that superinfection with a homologous strain of either *P. inui* var. *cynomolgi* or *P. knowlesi* failed to produce a re-infection in *S. rhesus*, or, if re-infection was produced, its effects were so mild that it could only be recognized by a very slight transient increase in the number of parasites in the peripheral blood. Having failed to produce re-infection in monkeys suffering from chronic infection with homologous strains of monkey plasmodia, they decided to study the effects of superinfection with heterologous strains. Accordingly, they selected 13 monkeys with chronic low-grade or latent infections. The dosage of infected blood and the route of administration were the same as in the previous work. The series of experiments with heterologous strains suggested that a chronic infection with one strain of *P. knowlesi* did not confer an effective immunity against the occurrence of an acute malarial attack following superinfection with different strains of the same parasite.

## Present investigation

To ascertain up to what length of time tolerance acquired by the monkey to re-infection with the same strain of *P. knowlesi* persists, experiments were carried out on the two monkeys one of which was infected with *P. knowlesi* in August 1932 and the other in February 1933, and during 1933 and 1934 we superinfected them with the same strain of the parasite on several occasions. These two monkeys along with two others have been kept in the protozoological laboratory for a long time as they harboured balantidium and other intestinal protozoa, which are of great value for teaching purposes.

## MONKEY I

### History of primary infection and subsequent inoculations

In December 1932 it was inoculated with 0.25 c.cm. of blood from a *S. rhesus* heavily infected with *P. knowlesi*. The parasites appeared in the blood on the 4th day of inoculation. On the 7th day the parasite count was very high (more than 60 per cent red cells were infected). Quinine (1½ grains) was given on four consecutive days. The parasites disappeared, but the blood picture was one of severe anaemia (red cells — 1,800,000 per c.mm., normoblasts +, Howell-Jolly bodies +, anisocytosis +, polychromatophilia +). This anaemic condition of the blood soon passed off. Relapse occurred on the 32nd day of inoculation. Multiplication of the parasite was controlled by the injection of one dose of 2 grains of quinine. Very scanty parasites were detected in the blood examined a month later. Henceforward the parasites appeared, disappeared and re-appeared in very scanty numbers till June 1933. The monkey was now

(Continued from previous page)

TABLE  
'Universal' or mixed indicator

pH	Colour	pH	Colour
1.0	Red	7.0	Greenish yellow
2.0	Pink	8.0	Green
3.0	Orange pink	9.0	Greenish blue
4.0	Orange	10.0	Blue
5.0	Orange yellow	11.0	Violet
6.0	Yellow	12.0	Purple

## REFERENCE

Clark, W. M. (1928). *The Determination of Hydrogen Ions*. Baillière, Tindall and Cox, London.

inoculated with the same strain of *P. knowlesi*. (We had then only one strain of *P. knowlesi*, isolated from a *S. irus* which was wrongly identified as a species of the genus *Cercopithecus*.) The blood films of this monkey were then examined every Saturday for two months. Scanty parasites were seen on three occasions only. In October 1933 it was given another injection with *P. knowlesi*, but no increase in the number of parasites was ever noticed in consequence. In March 1934 it was inoculated for the 4th time with the same parasite with the result that on the 13th day of inoculation there was an appreciable increase in the number of parasites in the monkey's blood, but they gradually decreased without any treatment. From October 1934 to December 1935 the blood of this animal was not examined nor was the animal used for any experimental work owing to the writer's absence from India. On his return the writer examined the animal for intestinal protozoa, particularly balantidium, and for plasmodial infection. The intestinal protozoal fauna was found to be nearly the same, but no plasmodial parasites were seen. To ensure that the monkey was absolutely free from plasmodial infection, its blood was examined daily for two months and once a week for the next 14 months. On no occasion were the parasites found. Then 5 c.cm. of blood were taken from the animal and injected into a young *S. rhesus* without any response. It was, therefore, reasonable to believe that the animal was cured of *P. knowlesi* infection. Now 0.25 c.cm. of blood from a rhesus monkey heavily infected with *P. knowlesi* (the same strain as used in the previous inoculations) was injected into this animal. On the 4th day the parasites were detected in the monkey's blood. The parasites multiplied very vigorously and on the 4th day of their first appearance in the blood, i.e., on the 8th day of inoculation, nearly 80 per cent of the monkey's red cells were parasitized and the animal died.

#### Summary

From December 1932 to March 1934 the monkey was inoculated four times with *P. knowlesi*. The initial attack ran an acute course which was interrupted by quinine treatment. There was a relapse following the initial infection, but this was readily arrested by a single dose of quinine (1½ grains intramuscularly). As a result of three subsequent inoculations no marked increase in the number of parasites in the monkey's blood was observed. After the 4th injection, however, there was a distinct increase in the parasite count. But no acute attack developed and the parasites gradually diminished without any treatment. The monkey's blood was not examined from October 1934 to December 1935. After this period the blood was systematically examined till July

1936, but no parasites were ever found. As a further proof that the monkey was now free from infection with *P. knowlesi* 5 c.cm. of its blood were injected into a young *S. rhesus*, but there was no response. At this stage the monkey was inoculated with the same strain of *P. knowlesi*; this resulted in a very severe infection and death of the monkey.

#### MONKEY II

##### *History of primary infection and subsequent inoculations*

In February 1933 this animal was infected with *P. knowlesi*. On the 8th day of inoculation it showed a very large number of parasites (52 per cent red cells parasitized and many of these showed multiple infection). The animal was treated with 0.05 gramme atebirin given intramuscularly for four days; 19 days after the treatment had stopped there occurred a severe relapse which was controlled by a course of quinine (1½ grains daily for four days). Blood examined on 3rd May, 1933, showed very scanty parasites. On this date it was re-inoculated with *P. knowlesi*. From the 7th day of inoculation the monkey's blood was examined daily for two weeks and no appreciable increase in the number of parasites was found and the animal remained quite active. From 4th June to 8th August, 1933, the blood was examined 42 times and during this period scanty parasites could be detected only on 9 occasions, the last positive finding being on 8th August, 1933. On the 9th August, it was injected again with *P. knowlesi*. The blood was not, however, examined till 9th October, 1933, when no parasite was seen. The blood was again examined for plasmodial infection on 1st, 5th, 8th and 9th November, 1933, but only very scanty infection was detected on the last two days. On 10th November, 1933, the monkey was inoculated for the 4th time. A week after the injection the blood was examined and a fair number of parasites was found. On 2nd January, 1934, the monkey's blood showed no parasites. It was re-inoculated with a massive dose (3 c.cm. of blood from a heavily parasitized monkey). A good number of parasites was noted on the 11th day of inoculation but this gradually diminished. On 18th June, 1934, the blood of the monkey was examined but no parasites were found. As in the case of monkey I, the blood of this animal was also examined systematically for more than a year, from January 1936. All these examinations proved negative. In February 1937 it was inoculated with 0.25 c.cm. of blood from a monkey heavily infected with the same strain of *P. knowlesi* as used for the primary inoculation. Severe infection resulted. Had it not been checked in time, the infection would have certainly proved fatal.

*Summary.*—As a result of the primary inoculation, a very severe attack developed as usual and it was arrested with a course of atebirin.

(Continued at foot of next page)

## RENAL EFFICIENCY IN GLAUCOMATOUS PATIENTS

By J. N. JASWAL, M.D., B.S., D.O.M.S. (Eng.)

*Provincial Medical Service, United Provinces*

GUIDED by the fact that cases of glaucoma and nephritis are seen in increasing numbers with advance in age and that both these diseases are related to the cardio-vascular system, I investigated the renal functions in glaucomatous patients by the urea concentration in the urine and the quantitative estimation of urea in the blood.

Before describing the actual methods and the findings, I confess that I am not an expert pathologist, so there might have been some errors in the readings of the tests, depending upon personal factors. To eliminate these errors as far as possible, I always do the same tests in normal healthy individuals of similar ages, usually one normal after every four or five glaucomatous patients. These findings may not give absolute values, but they almost certainly have a comparative value.

Various newer methods for detecting the renal efficiency have been introduced, but I adopted only the commonly practised tests for two reasons. Firstly, the technique is fully mastered

*(Continued from previous page)*

From 3rd May, 1933, to 18th June, 1934, the monkey received four more inoculations but on no occasion did severe infection develop. From October 1934 up to December 1935 the blood of the monkey was not examined for the same reason as in the previous case. Since January 1936 blood films were, however, examined systematically for more than a year with negative results. It was then inoculated with the same strain of *P. knowlesi* as was used for the initial inoculation. An acute attack resulted but was arrested by atebirin treatment.

### Conclusion

The results of the experiments recorded above suggest that the tolerance to re-infection with the same strain of *P. knowlesi* in *S. rhesus* monkeys, which can be developed by repeated inoculations combined with inadequate treatment, is dependent on the presence of the infecting organism in the animal's body, and, when the infection is got rid of, the animal becomes quite as susceptible as an uninfected subject. From analogy it is reasonable to believe that in the case of human plasmodial infections the acquirement of protection against further infection is associated with the existence of parasites in the body and after the infection has died out, tolerance to re-infection also disappears.

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- Knowles, R. (1934). *Ann. Rep. Calcutta School of Trop. Med.*, 1933, p. 43. Suppl., Govt. Printing, Bengal.  
Mulligan, H. W., and Sinton, J. A. (1933). *Studies in Immunity in Malaria. Part II. Rec. Malaria Survey of India, Vol. III*, p. 529.

by those who have been assisting me in the laboratory and, secondly, any method is good when only the comparative values are to be considered.

**Observations.**—From the tables the results of the analysis show that blood urea (84 cases) in glaucomatous patients is slightly but definitely increased. The average value of these cases is 43 mgm. of urea in 100 c.cm. of blood, as compared with the average 35 mgm. in 28 non-glaucomatous patients of advanced ages. Urea concentration also reveals that the average value in glaucomatous patients is 2.43 per cent (39 observations), while in normal healthy individuals it is 2.8 per cent (27 observations). On considering the diet, 68 out of 100 have been found to be non-vegetarians.

TABLE I  
*Blood urea findings*

Mgm. urea in 100 c.cm. blood	Glaucomatous patients	Control cases
15	1	1
16	1	..
20	2	1
21	2	..
22	2	..
24	3	2
25	2	1
26	..	3
27	4	..
28	2	..
29	1	1
30	3	1
32	1	2
33	..	1
34	2	..
35	3	3
36	1	..
37	..	1
38	3	2
39	1	..
40	4	1
41	2	..
42	4	2
43	2	1
44	1	..
45	4	3
46	2	..
48	5	..
49	1	..
50	4	..
52	1	..
54	2	..
55	1	..
56	1	1
57	1	..
58	2	..
59	1	..
60	..	1
61	1	..
62	2	..
63	1	..
64	1	..
68	3	..
70	1	..
76	1	..
78	1	..
87	1	..
84		28

From these findings it is evident that the nitrogen metabolism is really at fault. This is further supported by the fact that glaucoma is slightly more common in Mohammedans than in Hindus, the former being mostly non-vegetarians.

TABLE II  
*Urea concentration findings*

Percentage of urea in urine	Glaucomatous patients	Control cases
0.6	1	..
0.7	1	1
1.2	1	..
1.3	1	..
1.5	1	..
1.7	1	..
1.8	2	..
1.9	1	..
2.0	1	1
2.1	1	..
2.3	2	1
2.4	2	2
2.5	4	1
2.7	2	..
2.8	5	3
2.9	2	..
3.0	10	11
3.4	1	..
3.5	..	6
	39	27

### Discussion

Vele's observations in 50 cases of glaucoma indicated that there is a small rise in the blood urea, a fact which is clearly supported by my own findings. It is advisable to consider the significance of this slight hyper-uræmia.

Urea is derived from surplus amino-acids of the diet. The organism is only able to store these units by building them into tissue proteins, and unwanted amino-acids circulate in the blood stream and are removed by the liver where they are de-aminized. Urea is universally and fairly uniformly distributed throughout the tissues of the body, the concentration being of the same order as in the blood. Outstanding exceptions are adipose tissue, which has a low water content and renal tissue which contains urine. Anderson found urea in the aqueous humour sometimes above and sometimes below that in the plasma, and Rados found, as was to be expected, the amino-acid content variable, but in concentration comparable to that in the blood.

[Note.—It is a great pity that the writer did not apply statistical methods to these figures. It seems doubtful if the blood urea findings in the two groups are significantly different. In the case of the urea concentrations it is obvious from the most superficial examination that the means in the two groups are not 'significantly' different, as the mean concentration in the control group is  $2.80 \pm 0.67$ , a range which covers at least two-thirds of the observations in the glaucomatous group. The writer's conclusions based on a supposed difference are not therefore valid.—Editor, I. M. G.]

Pagoni gives the value of 22 to 40 mgm. per 100 c.cm. Duke Elder's figures are

Urea in intra-ocular fluid = 28 mgm. per 100 c.cm.

Urea in serum = 27 mgm. per 100 c.cm.

The urea values of the human tissues have not been explored, but from analogy with those of other animals the normal range is between the limits of 15 to 45 mgm. urea per 100 gm. fresh material, corresponding to average value of 18 to 38 mgm. per 100 c.cm., the extreme for normal blood being 10 to 50 mgm.

The uniformity of distribution is due to the unique diffusibility of urea. It is a substance for which plasma and whole blood analyses have the same significance. One result of this diffusibility is that urea retention in the organism cannot cause œdema such as occurs when partially or non-diffusible substances like sodium chloride accumulate in the plasma and lymph and dehydrate the neighbouring tissues.

I give below the pathological significance of hyper-uræmia.

Causes of hyper-uræmia :—

A. Increased production of urea by

(1) High protein consumption.

(2) Fevers.—The increase in urea depends more on the intensity of intoxication than on the degree of pyrexia and probably is aided by renal disturbance. Hyper-uræmia under this heading is attributed to active destruction of tissue proteins.

(3) Thyroxine administration.—The increased metabolism following the administration of thyroid autocoid may raise the level of blood urea. The effect is non-specific and can be inhibited by protein-sparing food such as glucose. Para-thormone also affects blood urea. Along with it there is usually hyper-calcæmia.

B. Decreased excretion of urea by kidneys, skin and intestines.

(1) Chronic renal inefficiency.

(2) Starvation.

(3) Diabetes mellitus.—50 per cent of cases of diabetic coma show hyper-uræmia. This may be due to many factors including disturbed protein metabolism, tissue autolysis, urea-genesis from non-protein sources such as glucose and ammonia, most probably renal poisoning by ketones or other abnormal metabolites.

(4) Acute intestinal obstruction.

(5) Toxæmias of pregnancy.

From the above-mentioned causes of hyper-uræmia only the following can be considered that might be associated in glaucomatous patients :—

(i) High protein consumption,

(ii) Intoxication due to fevers, septic foci and pregnancy,

(iii) Chronic renal inefficiency, and

(iv) Diabetes.

The disease being commoner in non-vegetarians and in Mohammedans favours the high protein consumption factor as one of the causes,

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# CLEARANCE OF *PISTIA STRATIOTES* AS A CONTROL MEASURE FOR *F. MALAYI* INFECTION

By W. C. SWEET, M.D., D.P.H.  
International Health Division of the  
Rockefeller Foundation  
and

V. MADHAVAN PILLAI, L.M.F.

Travancore State Department of Public Health

SUBSEQUENT to a survey of North Travancore, Iyengar (1932, 1936) reported a heavy incidence of *F. malayi* infection in the Shertalai

(Continued from previous page)

Increased erythrocyte sedimentation rate in the glaucomatous patients as given in another paper by me suggests the second cause, viz, the intoxication to be responsible for hyper-uræmia. Low urea concentration values indicate that there is slight renal inefficiency as well in glaucomatous patients, but on the other hand there is a contradictory finding that the intra-ocular tension in cases of nephritis (table III) is the same as in normal individuals. It may be that the intra-ocular tension rises with mild hyper-uræmia and falls with gross hyper-uræmia as found in cases of nephritis.

TABLE III

Showing intra-ocular tension in cases of renal disease

Serial no.	Renal disease	TENSION		Blood urea
		R. E.	L. E.	
1	Nephritis	30	..	54 mgm. per 100 c.c.
2	Renal stone	25	..	..
3	Interstitial nephritis	25	20	48 mgm. per 100 c.c.
4	Nephritis	20	20	..
5	Do.	22	20	..
6	Do.	24	..	46 mgm. per 100 c.c.
7	Do.	24	..	..
8	Chronic parenchymatous nephritis	22	..	185 mgm. per 100 c.c.
9	Nephritis	30	..	..

It appears that mild renal disturbance and slight hyper-uræmia are both caused by some toxin in the body and might be associated with some local change in the eye causing increased intra-ocular tension.

## Conclusions

(1) There is slight but definite increase in the blood urea and fall in the urea concentration values in cases of glaucoma as compared with the corresponding values in non-glaucomatous patients.

(2) There is no rise in the intra-ocular tension in cases of advanced renal diseases with very high blood urea.

taluk where night blood specimens from 6,404 persons had been examined and 1,754 found to have microfilariae present, an incidence of 27.4 per cent. Iyengar further reported (1936) that 23.0 per cent of these persons had elephantiasis or 'lymph-adenitis combined with temporary swelling of the leg during the febrile stage'; considering this finding he gave the filarial endemicity figures for the taluk as 46.6 per cent. Going over the original records it was possible to find reports of examinations of 1,348 persons, living in or near the area subsequently put under control and a surrounding comparison area, of whom 454, or 33.7 per cent, had microfilariae reported in their night blood specimens (see table I). The proportions of these people having microfilariae varied from 22.5 per cent in those 1 to 4 years old to 36.5 per cent in those 10 to 19 years of age. All of the microfilariae found in this taluk were reported as of the species *Mf. malayi* Brug.

By careful work on the epidemiology of this *F. malayi* infection, Iyengar (1932, 1933, 1936, 1937) found that it was carried in nature mainly by *Mansonia* (*Mansonioides*) *annulifera* Theobald, in over 900 specimens of which he found an infection rate of about 26.0 per cent, and that *Culex fatigans* was not infectible by this species even in the laboratory. Further, he found that *Mansonioides* laid eggs on the leaves of *Pistia stratiotes*, a water plant, and that the larvæ and pupæ penetrated the pistia roots by means of a strongly-chitinated structure at the tip of the breathing siphons and horns. Consequently, they never came to the surface for air. *Mansonioides* eggs and larvæ were never found on other water plants in nature. In view of these findings, he recommended that control of *F. malayi* infections be attempted in this area by the manual removal of pistia from the numerous water collections.

TABLE I

*Microfilaria malayi* in examinations of night blood specimens from residents of a portion of Shertalai taluk, North Travancore

April and May 1932

Ages	Number examined	Number with microfilariae	Per cent with microfilariae
1 to 4 ..	71	16	22.5 ± 3.3
5 to 9 ..	231	64	27.7 ± 2.0
10 to 19 ..	334	122	36.5 ± 1.8
20 and over	712	252	35.4 ± 1.2
All ages ..	1,348	454	33.7 ± 0.9



*Control work\**

Late in 1933 control work was organized by government in an area of approximately 15 square miles centering on Shertalai town. The control unit had sixteen coolies and four overseers with a sub-assistant surgeon in charge,

Preliminary pistia clearance was begun in November 1933 but it was not until July 1934 that the first well organized round of the area was started and not until April 1935 that it was completed. Thereafter fourteen rounds were made up to the middle of January 1937



Fig. 1.—*Pistia stratiotes*.  
Photograph by Dr. P. F. Russell.

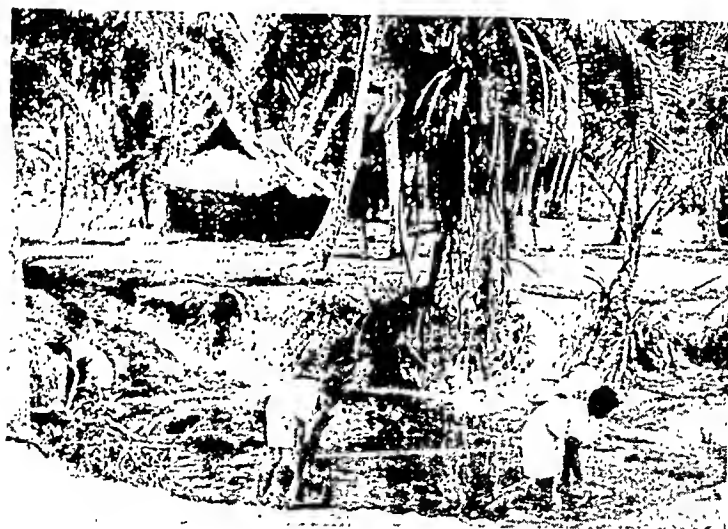


Fig. 2.—Manual removal of pistia.  
Photograph by Dr. P. F. Russell.

and its work consisted of the periodic clearance of pistia from all water collections in the control area. A research assistant, stationed at Pattanakkad outside of the control area, made observations on *Mansonioides*, collected blood specimens, made mosquito catches and carried on other parts of a research programme.

\*The control work here reported was begun by the Government of Travancore in 1933 and was at the suggestion and under the direction of M. O. T. Iyengar. He gave the results of the work, up to the date of his leaving Travancore, in references 3 and 4 given at the end of this article.

the fifteenth having been begun in February 1937. Table II gives the number of days required for each round and the estimated acreage of pistia removed each time.

In January 1937 the staff was increased by sixteen coolies and four overseers and an area of about 24 square miles was added to the original zone.

Mosquito collections were made monthly at eight stations, two of which were located in the middle of the control area at Shertalai and Thannirmukkam, two midway between these

central stations and the border of the control zone, two at the border, and two beyond the area under control. In table III are given the

TABLE II

*Number of days required for each round of pistia clearance and estimated acreage of pistia cleared in the original control zone of about 15 square miles*

	Number of days per round, (including all holidays)	Estimated number of acres of pistia cleared	Date of starting round
Preliminary	249	200	9th Nov., 1933
First ..	272	596	16th July, 1934
Second ..	125	281	14th April, 1935
Third ..	88	189	19th Aug., 1935
Fourth ..	104	137	15th Nov., 1935
Fifth ..	41	46	27th Feb., 1936
Sixth ..	32	25	8th April, 1936
Seventh ..	15	8	11th May, 1936
Eighth ..	11	5	26th May, 1936
Ninth ..	15	5	6th June, 1936
Tenth ..	20	8	22nd June, 1936
Eleventh ..	34	13	13th July, 1936
Twelfth ..	79	30	17th Aug., 1936
Thirteenth	68	48	4th Nov., 1936
Fourteenth	28	17	20th Jan., 1937

results of these catches per hour as they were reported to the director of public health.

The removal of pistia was intended as a control of the *Mansonioides* species only and, judging from the reported figures as given in table III, it was an effective measure since no specimens of these species were reported from the central catching stations after 1935; there seemed to be no appreciable change in the catches of other mosquitoes, which were not affected by the removal of the pistia. At no

time was oil used or any other measure employed for the control of culicine and anopheline species.



Fig. 3.—Elephantiasis of the leg in young boys four and five years old.

Photograph by Dr. P. F. Russell.

Four times during the year 1935 blood slides were collected at night by the research assistant from samples of the population living within and outside of the controlled area and examined at the Public Health Institute in Trivandrum. As the last examination was made in August,

TABLE III

*Mosquito catches per hour from stations within and outside of the control area*

Place	Catching station	1934 (LAST 5 MONTHS)		1935		1936		1937 (FIRST 3 MONTHS)	
		All mosquitoes	Mansonioides	All mosquitoes	Mansonioides	All mosquitoes	Mansonioides	All mosquitoes	Mansonioides
Thannir-mukkam.	At centre of control.	..	..	27.6	0.06	26.7	0.0	19.7	0.0
	Midway	..	..	26.8	0.2	28.7	0.06	20.7	0.0
	Border	..	..	26.6	1.0	32.9	1.2	23.0	3.3
	Outside of control.	..	..	34.3	2.2	40.4	3.1	25.4	5.1
Shertalai ..	At centre of control.	18.0	0.8	30.0	0.1	30.3	0.0	23.3	0.0
	Midway	19.2	0.7	28.4	0.2	27.9	0.2	26.6	0.0
	Border	30.7	2.7	32.6	1.4	35.1	1.8	30.3	4.6
	Outside of control.	36.3	12.9	35.8	3.6	44.8	3.6	37.4	7.6

1935, only four months after the end of the first complete round of pistia clearance, the figures of these examinations are not given here. It is of interest to note, however, that although there was no significant change from the microfilaria percentages of the 1932 survey in those examined inside of the controlled zone, the incidence of infection seemed to have dropped in the comparison area in persons over ten years old. There was no apparent explanation for this drop, unless it was seasonal, and no later examinations were made to confirm it. In

to judge how long after the cessation of re-infection one might expect to find microfilariae in the peripheral blood, although it seems probable that the period would not be a short one. Furthermore, since adults were more likely than children to make overnight visits to uncontrolled areas, it seemed probable, all things considered, that the only way to judge the effectiveness of the control methods would be to examine very young children only. Consequently, house to house visits were made by the writers in April 1937 on four successive nights between 8-30 and



Fig. 4.—Pistia choking an irrigation ditch.  
Photograph by Dr. P. F. Russell.

August 1935 the microfilaria incidence in 17 children from one to four years old was  $29.4 \pm 7.5$  per cent, not significantly different from the  $21.2 \pm 4.8$  rate of 1932 (see table I).

#### Survey of young children

Since information is lacking as to the length of life of an infecting *F. malayi*, it is not possible

12-30 p.m., collecting thick blood slides from children under 5 years of age. It was possible to get blood slides from a total of 174 children, 87 living within the controlled zone and near the centre of it and 87 in the comparison area well removed from the possible effects of control. Results of these examinations are given in table IV.

TABLE IV

Results of examination of night blood specimens taken from children in the Shertalai area  
April 1937

Age	LIVING NEAR THE CENTRE OF THE CONTROLLED AREA			LIVING IN A COMPARISON AREA		
	Number examined	Number with microfilaria	Per cent	Number examined	Number infected	Per cent
Under 1 year	14	0	0.0	12	1	8.3
1 year	25	0	0.0	18	2	11.1
2 years	32	0	0.0	26	8	30.8
3 years	13	1	7.7	25	10	40.0
4 years	3	0	0.0	6	2	33.3
Total	87	1	$1.1 \pm 0.8$	87	23	$26.4 \pm 3.2$
1 to 4 years	73	1	$1.4 \pm 0.9$	75	22	$29.3 \pm 3.5$
2 years and under	71	0	0.0	56	11	$19.6 \pm 3.6$

In the controlled area there was only one child, three years and six months old, who had microfilariæ in its night blood specimen whereas in the comparison area there were found 23 infected children in a group of approximately the same ages. All of the microfilariæ found were *Mf. malayi*. The percentage of infected children one to four years old in the comparison area,  $29.3 \pm 3.5$ , was not significantly different from the percentages found in the same general area in 1932 and 1935, so it would seem to be practically certain that the drop in infection in the controlled area can be regarded as a result of the control work. As the first complete pistia clearance in the controlled area was finished in April 1935 and these examinations were made in April 1937 it seemed fair to use children two years old and under as a test. When this test was applied, there were found no infections in 71 controlled-area children as against eleven infections, or 19.6 per cent, in 56 children living in the comparison area. If the true incidence of infection is taken as 20.0 per cent, one would not find fewer than five infections among 70 children as often as once in 200 trials (Pearl, 1930). There was a real and large reduction in filariasis in children born since control measures were begun.

Since one infection in 16 children three and four years old, examined from the controlled area, by Pearl's table is within the sampling error of the comparison area incidence, it cannot be concluded on the basis of the 1937 examinations that there was any reduction of infection in the controlled-zone children of these particular ages. In the control of filariasis one cannot expect that any change will occur in the existing elephantiasis rate of the area. Furthermore, what will occur in the persons already infested with filarial worms is unknown; the worms may die without later effect or they may go on to develop elephantiasis. It is quite possible that the public will see no change in this disease until the generation now two years old has grown up, and then only if the pistia clearance is continued throughout the years with its present efficiency.

It is possibly of interest to emphasize again that the pistia clearance was a control method aimed entirely at the *Mansonioides* species and that it had no apparent effect on other species of mosquitoes. The control of the *F. malayi* infection in children makes an excellent example of the suppression of a mosquito-borne disease by a strictly limited species control of the carrier.

#### Summary

The control in young children, by means of *Pistia stratiotes* destruction, of the *Mansonioides*-carried *F. malayi* infection in a 15-square mile area of the Shertalai taluk of North Travancore, is reported. In 71 children two years old and under there were no infections in the controlled

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## THE EFFECT OF REDUCED PRESSURE COMBINED WITH INCREASED TEMPERATURE ON THE VIABILITY OF BED BUGS AND OF THEIR EGGS

By E. SOMASEKHAR, M.R.C.S. (Eng.),

L.R.C.P. (Lond.), D.P.H.

District Medical Officer, M. and S. M. Railway,  
Guntakal

THERE is little, if any, literature on this subject either in parasitological or entomological publications. At the instance of the Chief Medical Officer of the M. & S. M. Railway, experiments were carried out in 1934 at the King Institute, Guindy (Madras), to investigate the effects of reduced pressure on bed bugs and their eggs (Webster, 1934).

The results of that investigation showed that much reduced pressures were insufficient to destroy the eggs. The question is one of great importance to administrations involved in the carrying of passengers in vehicles; it is of particular importance to railway authorities in India, where constant reinfestation of passenger vehicles takes place and where conditions are eminently favourable for the development and multiplication of bugs. Further experiments were therefore conducted to discover the effect of increased temperature combined with reduced pressure. A sketch of the apparatus used is given.

Bugs and their eggs were collected from passenger vehicles; the eggs were examined microscopically to ensure that the opercula were intact. It was, however, discovered that a large proportion of eggs thus collected failed to hatch out under normal laboratory conditions. To overcome this difficulty live bugs were kept in test

(Continued from previous column)

zone while 19.6 per cent of 56 children in a nearby comparison area were found to have *Mf. malayi* in specimens of blood taken at night.

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[Note.—The parent worm of *Microfilaria malayi* has never yet been seen so the use of the generic name *Filaria* is not strictly admissible. It appears preferable to use the term *Mf. malayi*, only, for the present and to defer naming the adult worm until it has been found and correctly classified.—EDITOR, I. M. G.]

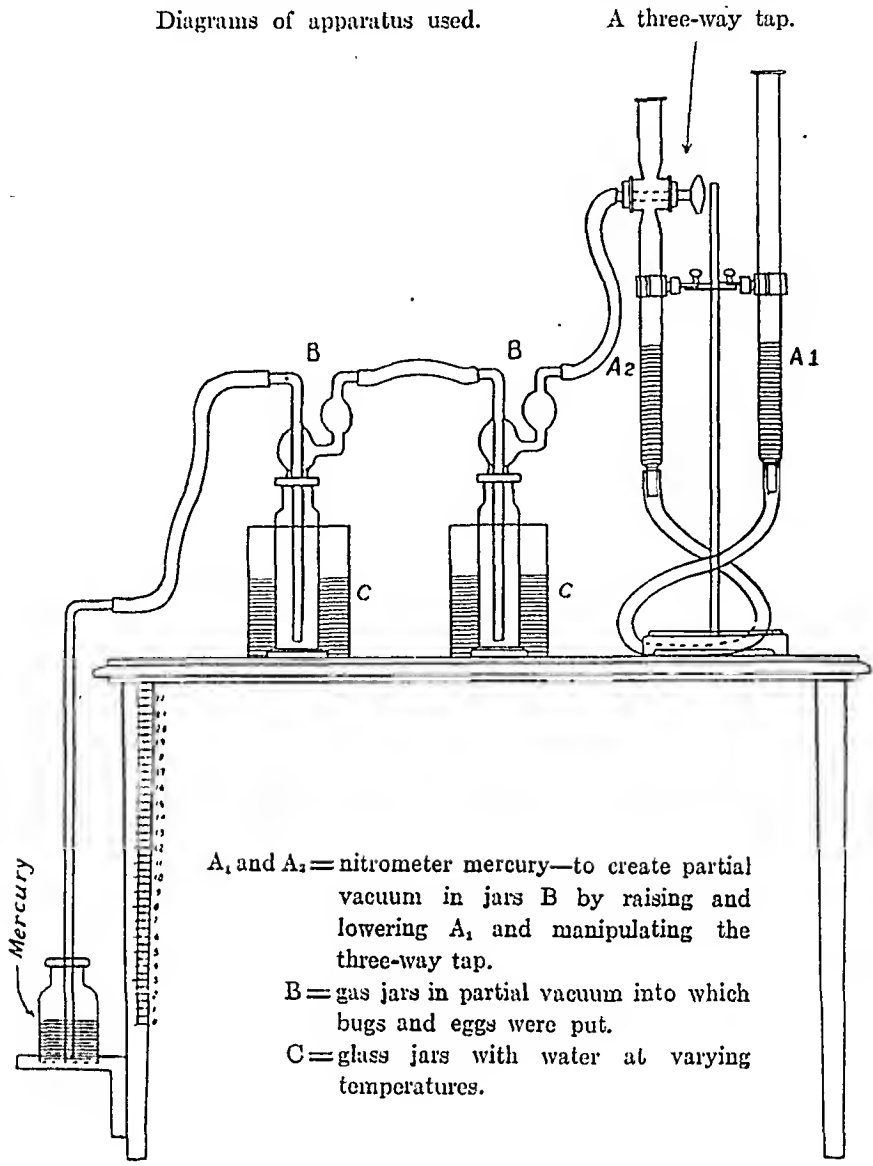


TABLE A

Date	Pressure in inches of mercury	Number of eggs or bugs	Time exposed	Temperature	Number <sup>a</sup> hatched
8-1-37	15	12 eggs	15 min.	47°C.	9
	15	8 bugs	15 "	47°C.	Living
		12 eggs	Control		11
11-1-37	15	11 eggs	20 min.	47°C.	0
	15	7 bugs	20 "	47°C.	Dead
		14 eggs	Control		14
13-1-37	15	11 eggs	25 min.	47°C.	0
	15	9 bugs	25 "	47°C.	Dead
		12 eggs	Control		11
15-1-37	15	12 eggs	30 min.	47°C.	0
	15	8 bugs	39 "	47°C.	Dead
		12 eggs	Control		12
20-1-37	15	8 eggs	35 min.	47°C.	0
	15	10 bugs	35 "	47°C.	Dead
		8 eggs	Control		7
21-1-37	15	8 eggs	40 min.	47°C.	0
	15	6 bugs	40 "	47°C.	Dead
		11 eggs	Control		11
29-1-37	15	9 bugs	25 min.	44°C.	Living

tubes until a sufficient number of eggs had been laid and collected.

Control eggs used in experiments were taken from the same batch as the eggs used in the experiments.

The results are shown in table A.

Exposure to a temperature of 47°C. (116.6°F.) together with a negative pressure from 15 inches of mercury for 25 minutes resulted in the death of all bugs and all eggs; at the same pressure for the same time but with a temperature of 44°C. (111.2°F.) the bugs continued to live (table A).

Experiments were then continued with a constant temperature of 47°C. (116.6°F.) for a fixed time of 25 minutes, but with a variation in the negative pressure, from 16 inches of mercury to 30 inches of mercury (table B). All the adult bugs died and no eggs hatched out, although the control eggs in these batches hatched out normally.

TABLE B

*Showing effects of exposure at 47°C. for 25 minutes*

Date	Pressure in inches of mercury	Number of eggs or bugs	Number hatched
3-2-37	16	12 eggs	0
	16	6 bugs	Dead
	Control	11 eggs	11
4-2-37	17	12 eggs	0
	17	6 bugs	Dead
	Control	12 eggs	12
6-2-37	30	12 "	0
	18	16 eggs	0
	Control	9 bugs	Dead
8-2-37	15 eggs	15	15
	19	13 eggs	0
	Control	7 bugs	Dead
10-2-37	13 eggs	13	13
	20	15 eggs	0
	Control	6 bugs	Dead
17-2-37	15 eggs	15	15
	22	9 eggs	0
	Control	7 bugs	Dead
19-2-37	10 eggs	10	10
	30	10 "	0
	25	12 eggs	0
	25	6 bugs	Dead
	30	7 "	"
	Control	12 eggs	12

In order to make certain that the diminution in pressure had any effect on the experiment, a control experiment was performed (table C) with the same temperature (47°C.) and for the same time (25 minutes) but at normal atmospheric pressure. The same result was obtained as if the pressure had been decreased. A similar result was obtained with a higher temperature

of 49°C. (120.2°F.) for the same time (25 minutes) but at normal atmospheric pressure (table D).

TABLE C

*Showing effects of exposure at 47°C. for 25 minutes*

Date	Pressure	Number of eggs or bugs	Number hatched
27-2-37	Normal pressure. Control	40 eggs 32 bugs 40 eggs	None hatched Dead 38

TABLE D

*Showing effects of exposure at 49°C. for 25 minutes*

Date	Pressure	Number of eggs or bugs	Number hatched
2-3-37	Normal pressure. Control	33 eggs 24 bugs 33 eggs	None hatched Dead 33

A microscopic examination of eggs subjected to lethal conditions revealed the fact that the opercula were intact, although the eggs appeared to have lost their original shape and were irregularly flattened in contour.

### Conclusions

1. That a reduction in pressure is of no importance in practical methods of destroying bed bugs and their eggs in passenger vehicles.

2. That exposure to a constant temperature of 47°C. (116.6°F.) for 25 minutes causes the death of both adult bugs and eggs at normal atmospheric pressure and therefore the lethal effect is more certain at 49°C. (120.2°F.) at normal atmospheric pressure. The laboratory where the experiments were carried out is at sea level.

The practical application of the above conclusions raises certain difficulties which require further investigation. Firstly, it is essential that the hidden crevices in woodwork in rolling-stock, crevices which are especially attractive to adult bugs for oviposition, should themselves during disinfection be raised to the temperature required and kept at that temperature for 25 minutes. The time taken for the heat, applied, for example, in an oven at 120°F., to penetrate completely through all parts of woodwork and metal work must be investigated.

Secondly, the result of exposure to a temperature of 120°F. for 25 minutes, plus the time taken for that heat to penetrate to all parts of the vehicle—on glued joints, various fittings such as leather, and all moving parts—must be investigated. The effect on paint work is not likely

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## SANITARY IMPROVEMENTS THROUGH VILLAGE HEALTH LEAGUES

By K. PRASADA, D.P.H.

Medical Officer in charge, Health Unit,  
Partabgarh, U. P.

### INTRODUCTION

A 'HEALTH LEAGUE' may be defined as a voluntary agency organized in a village for the purpose of inculcating in the inhabitants the ideal of self-help, in relation to the care and promotion of their own health and the cultivation of a spirit of friendly helpfulness towards others. It is a decided improvement on other organizations of a similar nature, which have been tried in the past.

Experience shows that no village scheme can be successful or can give permanent and tangible results unless the sympathy, interest and active support of the villager have been enlisted.

To have the desired results, the public health worker will have to undertake some preliminary work of an educational nature. With the help of the local leaders he should create among the villagers a desire for improvement and the spirit of self-help and service. He should make the fullest use of his powers of observation and persuasion as well as the qualities of leadership. The traditional spirit of corporate action for mutual benefit should be revived among the villagers so that they may work together, 'each for all and all for each'.

Once he has succeeded in changing the outlook, he will find that a health league is a convenient means whereby to approach the people. There is a concentration of effort in place of dispersal of activity. The entire village, acting as a body, has the benefit of his advice and instructions. The league functions as a local agency to look after the welfare of the village and to make sure that the programme, decided upon by common consent, is carried out by all the inhabitants.

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to be deleterious as the temperature in the sun on the outside of vehicles is frequently higher than 120°F.

As an alternative to chemical methods of disinfection the subjection of vehicles to a temperature of 120°F. for a certain period possesses great advantages; the heating method should be simple, safe, and economical.

I wish to thank Dr. R. J. Dyson, Chief Medical Officer, M. & S. M. Railway, for his help, suggestions, and permission to publish these findings. My thanks are also due to my assistant, Dr. Ramachandran, for carrying out the experiments and to Dr. Balu for supplying the bugs and eggs.

### REFERENCE

Webster, W. J. (1934). Bed Bugs in Rarefied Air. *Indian Journ. Med. Res.*, Vol. XXI, p. 523.

### CONSTITUTION

Each village should preferably have its own health league. An attempt should be made to enrol a member from each family. The office-bearers—a chairman, an honorary secretary and four members of the executive committee—should be elected at the annual general meeting. They should represent all classes, interests and communities. The chairman should preferably be an influential person commanding the respect of the inhabitants, while the secretary may be an educated young man or a school teacher resident in the village. Retired civil and military officials prove very suitable for service on the committee.

Meetings of the general body should be held regularly once a month. The proceedings should be recorded in a minute book, as also the work contemplated or actually accomplished. The public health worker should make it a point to attend all such meetings as he supplies the necessary driving power to the organization and acts as its guide.

### ACTIVITIES

The public health worker should carry out a preliminary survey of the village. This will help him in knowing the area, the people and the local needs. It might be desirable to make a record of the findings so that the progress may be easily gauged at a later date. If possible actual photographs should be taken to illustrate the existing conditions.

He should work mostly by explanation and persuasion supplemented in some cases by demonstration. The work should be done through the health league, the individual members being also approached, wherever possible.

The programme should be taken up systematically, one step when completed by all the members to be followed by the next one. Before taking up a fresh item on the programme care should be taken to see that the first one has been carried out by the entire village.

It will be an advantage to take up works of an inexpensive nature in the beginning. The various activities that may be undertaken by the league are detailed below :—

1. In a register the secretary can record all births and deaths occurring in the village. The information will be available from the local *dai*, barber or washerman, besides the members of the league.

2. The organizer will be glad to undertake the work of popular health education through talks with individual members and lectures to the people at their meetings or other gatherings. He will utilize sanitary models, health posters, charts and exhibits, and will if possible make use of the gramophone, the magic lantern, the cinema or the radio. He will also give training in first-aid, sanitation and anti-epidemic measures to a few selected young men of the locality. These 'village-aiders' can be provided with outfits containing a tourniquet, a



trees, e.g., oranges, papayas and guavas. Green leafy and other vegetables rich in vitamins, for example, cabbage, spinach and tomato, can be cultivated in the home garden, thus adding to the quality, variety and quantity of the family food supply. The improvement of the breed of milch cattle and goats can also engage the attention of the league.

9. To break the dull monotony of village life, the league can, with advantage, arrange for exercises and games, competitions and matches, music parties and dramatic performances (on health and general topics) and village (health) exhibitions.

10. If the funds permit, the league can take up a more ambitious programme, e.g., the construction of a platform or a village hall for holding meetings, building quarters for the trained *dai* or a maternity centre, opening a village dispensary or a first-aid and anti-epidemic centre, providing a playground or a village park and starting a small library. Some literature on public health will be available from the local Red Cross unit or the public health authorities of the area.

#### WOMEN'S HEALTH LEAGUE

In areas with adequate maternity and child-welfare staff the health league principles may be applied to popularize the work among women and to secure their co-operation and assistance. The health visitor will have to carry out most of the work. Her chief concern should be to win over the confidence of the women so that they might take the fullest advantage of the services provided, viz, physical examination and individual attention by doctor, group instruction by health visitor, treatment of minor ailments and classes for training of 'little mothers'. The midwives will find that, as the league grows popular, they are informed about pregnancies at an earlier stage and all babies are vaccinated in time. Urine samples for analysis will be available more readily. All cases will be delivered by the qualified midwives. Attendance at the centres will increase.

As soon as the women are convinced of the utility of the work they will volunteer their assistance in the weighing of babies and distribution of cod-liver oil, sprouting gram, etc., at the clinics. They might take part in the demonstrations on infant care and management. Some might give their time to sewing garments or making toys for the babies attending the centre. Those, who can afford it, might possibly provide food and clothing for the needy or award prizes in connection with baby shows, which may be organized by the league.

#### RESULTS

For some time past sanitary improvements have been attempted through the agency of health leagues in a number of villages in the health unit, Partabgarh, an experimental scheme financed by the U. P. Government, the Indian Red Cross and the Rockefeller Foundation of America. The results have been very satisfactory.

In one of the villages, for instance, vaccinations against smallpox have grown so popular that this year there was no difficulty in vaccinating all children and re-vaccinating the rest. All these people had evaded vaccination of even the infants during the three years prior to the organization of the leagues. Every man, woman and child is now immunized. Each family has its own bored-hole latrine and manure-pit of standard dimensions. The league has given a genuine and lasting impetus to health activity in the locality and the inhabitants have come forward to spend money over the improvement of the village. All the wells are now of the approved type.

The various public health measures are being gradually extended to other villages in which too every family will be benefited.

It is indeed a pleasure to work among people who are 'improvement-minded' and who believe in self-help. The members show greater interest in hygiene and sanitation and take a pride in their villages which are now demonstrating centres to others.

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## A Mirror of Hospital Practice

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### LITHOLAPAXY IN A CASE OF CYSTOCELE

By E. T. N. TAYLOR

MAJOR, I.M.S.

Civil Surgeon, Manipur, Imphal, Assam

A MANIPURI female, aged 72 years, came in with a cystocele of the size of a hen's egg which projected through the vulval orifice, and inside it the major portion of a stone could be distinctly palpated. She had symptoms of the stone early in 1934. Micturition became more frequent and painful owing to the amount of straining required to pass urine, and about June

1936 she first noticed the protruding cystocele. She demonstrated how she had to reduce the cystocele manually before passing urine.

Owing to the extreme emaciation and feebleness, it was decided to do the operation without a general anæsthetic. On 15th June, 1937, while the patient was under the influence of morphia  $\frac{1}{4}$  gr., the assistant reduced the cystocele with two fingers in the vagina, while the phosphatic stone was carefully and rapidly crushed by a large lithotrite with scarcely any discomfort to the patient owing to the ease with which the pieces of stone could be manipulated into the jaws of the lithotrite. A large urethra made the evacuation of the fragments an easy affair. The weight of the

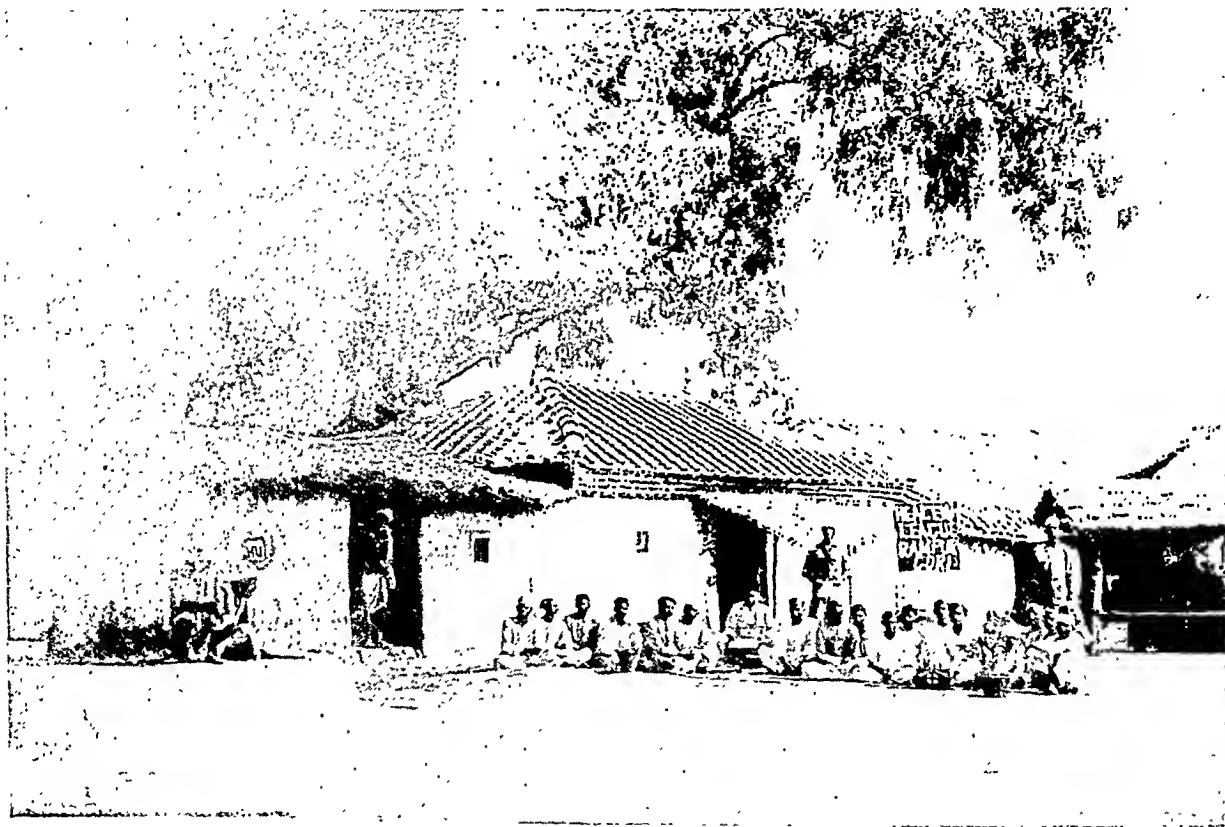
few bandages, permanganate of potassium, essential oils' mixture, cinchona febrifuge, etc.

3. A suitable person in the village should be suggested to hold charge of the village medicine box, containing simple remedies for common ailments. After a little training he will be able to give out medicines and to maintain a record of the stock received and the patients treated.

4. The league could also arrange for the prompt reporting of epidemic diseases. It can actually initiate steps to control the disease. Through it, it will be quite easy to vaccinate or re-vaccinate the whole village and to give preventive inoculations against cholera or plague. The leaders of the village prove useful

school. The assistance may be either in cash or in kind.

7. In the matter of general environmental sanitation the league should see that every member constructs a manure pit for the storage of refuse and has a soakage-pit, if necessary, for the disposal of waste water. He should install a sanitary privy to avoid soiling the village site. For better light and ventilation in the house, windows should be opened up. New houses should be built on sanitary lines. Cattle byres should also be ventilated and separated from the living rooms. Wells should be improved and public urinals and bathing enclosures for women may be provided if necessary. Bathing and washing on the platform of



in inspiring confidence among the villagers and impressing upon them the prophylactic measures to be adopted.

5. The league is in the best position to recommend indigenous *dais* for training in clean midwifery. It should see that the trained *dais* are popular and do the work on right lines. In abnormal labours the league is likely to prove successful in removing the mothers to the nearest hospital. Possibly assistance may be forthcoming to provide milk or clothing for the infants of indigent mothers.

6. Similarly health leagues in more prosperous villages may help the school teachers in arranging for the midday meals of the scholars or in providing sanitary conveniences for the

a well, collecting refuse or sullage near it and committing nuisance within the houses should be forbidden. Cutting of rank vegetation, removal of piggeries to one side of the village and fencing or demolishing abandoned houses are measures for the abatement of nuisance. Excavations which collect water and breed mosquito larvæ should be drained or filled up. No one should dig any fresh pits near the habitations. Wells should be cleansed of silt every year and the entire village put in good order by observing a 'cleansing day' every month.

8. Cultivation of flowers in front of houses or in the vicinity of wells will considerably enhance the beauty of the village. If land is available, efforts should be made to grow fruit

trees, *e.g.*, oranges, papayas and guavas. Green leafy and other vegetables rich in vitamins, for example, cabbage, spinach and tomato, can be cultivated in the home garden, thus adding to the quality, variety and quantity of the family food supply. The improvement of the breed of milch cattle and goats can also engage the attention of the league.

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#### WOMEN'S HEALTH LEAGUE

In areas with adequate maternity and child-welfare staff the health league principles may be applied to popularize the work among women and to secure their co-operation and assistance. The health visitor will have to carry out most of the work. Her chief concern should be to win over the confidence of the women so that they might take the fullest advantage of the services provided, *viz.* physical examination and individual attention by doctor, group instruction by health visitor, treatment of minor ailments and classes for training of 'little mothers'. The midwives will find that, as the league grows popular, they are informed about pregnancies at an earlier stage and all babies are vaccinated in time. Urine samples for analysis will be available more readily. All cases will be delivered by the qualified midwives. Attendance at the centres will increase.

As soon as the women are convinced of the utility of the work they will volunteer their assistance in the weighing of babies and distribution of cod-liver oil, sprouting gram, etc., at the clinics. They might take part in the demonstrations on infant care and management. Some might give their time to sewing garments or making toys for the babies attending the centre. Those, who can afford it, might possibly provide food and clothing for the needy or award prizes in connection with baby shows, which may be organized by the league.

#### RESULTS

For some time past sanitary improvements have been attempted through the agency of health leagues in a number of villages in the health unit, Partabgarh, an experimental scheme financed by the U. P. Government, the Indian Red Cross and the Rockefeller Foundation of America. The results have been very satisfactory.

In one of the villages, for instance, vaccinations against smallpox have grown so popular that this year there was no difficulty in vaccinating all children and re-vaccinating the rest. All these people had evaded vaccination of even the infants during the three years prior to the organization of the leagues. Every man, woman and child is now immunized. Each family has its own bored-hole latrine and manure-pit of standard dimensions. The league has given a genuine and lasting impetus to health activity in the locality and the inhabitants have come forward to spend money over the improvement of the village. All the wells are now of the approved type.

The various public health measures are being gradually extended to other villages in which too every family will be benefited.

It is indeed a pleasure to work among people who are 'improvement-minded' and who believe in self-help. The members show greater interest in hygiene and sanitation and take a pride in their villages which are now demonstrating centres to others.

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## A Mirror of Hospital Practice

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### LITHOLAPAXY IN A CASE OF CYSTOCELE

By E. T. N. TAYLOR

MAJOR, I.M.S.

Civil Surgeon, Manipur, Imphal, Assam

A MANIPURI female, aged 72 years, came in with a cystocele of the size of a hen's egg which projected through the vulval orifice, and inside it the major portion of a stone could be distinctly palpated. She had symptoms of the stone early in 1934. Micturition became more frequent and painful owing to the amount of straining required to pass urine, and about June

1936 she first noticed the protruding cystocele. She demonstrated how she had to reduce the cystocele manually before passing urine.

Owing to the extreme emaciation and feebleness, it was decided to do the operation without a general anaesthetic. On 15th June, 1937, while the patient was under the influence of morphia  $\frac{1}{4}$  gr., the assistant reduced the cystocele with two fingers in the vagina, while the phosphatic stone was carefully and rapidly crushed by a large lithotrite with scarcely any discomfort to the patient owing to the ease with which the pieces of stone could be manipulated into the jaws of the lithotrite. A large urethra made the evacuation of the fragments an easy affair. The weight of the

dried fragments was 600 grains. Convalescence was rapid and the patient left the hospital on the 20th.

On 9th September, at my request, she walked a mile to the hospital to report herself. The general condition was greatly improved. She denies emphatically any urinary discomfort, though the cystocele is still present in a lesser degree.

## QUININE TOLERANCE IN PREGNANCY

By S. C. SEN GUPTA, D.T.M.

Resident Medical Officer, Hope Tea Estate,  
P. O. Nagrakata, Jalpaiguri

A EUROPEAN lady, aged about 30 years, had bilious vomiting on 23rd October, 1936, at about midnight. In the morning of 24th October her temperature was 99.4°F. She was sick off and on, and could not retain anything.

*Previous history.*—She went out for a picnic on 23rd October, 1936, in the morning in a forest near a river. When she came back in the evening she did not feel well. At about midnight she started bilious vomiting with undigested food and she also felt feverish. She had suffered from malaria once or twice previously. She came to the Dooars about a year ago.

I found the following conditions at 7 a.m. on 24th October:—

She was vomiting bile and could not retain anything. She complained of headache and uneasiness. Temperature—99.4°F. Pulse—88 per minute. Respiration—normal. Tongue—slightly coated and moist. Bowels opened once but not well. No sign of jaundice present. Heart and lungs—normal. Liver and spleen—not palpable. She was pregnant seven months (primipara).

She was given a dose of Eno's Fruit Salt which she vomited. Carminative mixture three times a day was given but she retained one dose only. She was put on liquid diet.

25th October, 1936.—Her temperature rose to 102.4°F. in the morning. Blood examination—rings of *P. falciparum* in small numbers found. Bilious vomit was much less. Quinine bihydrobromide grs. 4 in capsules were given four times a day and alkaline mixture 20 minutes before each capsule. In the evening, temperature came down to 99°F.

26th October, 1936.—Morning temperature 98°F. and evening temperature 98.4°F. Bilious vomit stopped. The patient felt comparatively better. Blood examination—rings of *P. falciparum* still present. A full dose of Eno's Fruit Salt acted well. Same treatment was continued as on previous day.

27th October, 1936.—Morning temperature 96°F. She felt much better. Blood examination—rings of *P. falciparum* still present in numbers. Quinine capsules were repeated. Evening temperature—103°F. when she was semiconscious, delirious and started vomiting bile again. Blood examination—rings of *P. falciparum* present in large numbers. Atebrin was objected to so quinine bihydrochloride grs. 10 was injected intramuscularly and alkaline mixture was continued. Application of ice on head and ice to suck were ordered.

28th October, 1936.—Morning temperature 101°F., semiconscious, delirious and vomiting bile less often. Blood examination—rings of *P. falciparum* in larger numbers found at 7 a.m.

R. Calomel .. gr.  $\frac{1}{2}$   
Sodium bicarbonate .. grs. 5

Two such powders were given at half-hour interval.

At 8-30 a.m. quinine bihydrochloride grs. 10 was injected, and alkaline mixture four doses a day was given.

At 10 a.m. she was given a dose of two drams each of sodium and magnesium sulphate in one ounce of water.

At 12 noon, her temperature was 102.4°F. Blood examination—rings of *P. falciparum* in increased numbers. Quinine bihydrochloride grs. 10 was injected. Glucose and sodium bicarbonate solution to drink *ad lib.* and 4 oz. per rectum every two hours.

At 6 p.m., temperature—99.4°F. The patient regained consciousness and complained of uterine pain. Fœtal heart sounds faintly audible and patient could feel the movement of the fœtus. Blood examination—rings of *P. falciparum* numbers increased. Quinine bihydrochloride grs. 10 injected and potassium bromide grs. 30 was given by mouth.

29th October, 1936.—Morning temperature—97.4°F. The general condition of the patient was better except she complained of occasional uterine pain due to excessive movement of the fœtus. Blood examination—rings of *P. falciparum* in increasing numbers found. Quinine bihydrochloride grs. 10 injected. Alkaline mixture, glucose and sodium bicarbonate solution as before.

At 12 noon, temperature—98.8°F. Blood examination—same as morning. Quinine bihydrochloride grs. 10 was injected.

At 6 p.m., temperature—101.6°F. Blood examination—degenerating forms of *P. falciparum* found. Quinine bihydrochloride grs. 10 was injected. Potassium bromide grs. 20 was given at bed time.

30th October, 1936.—Morning temperature—97.6°F. Patient was much better and had no uterine pain. Blood examination—after a prolonged search of two blood films only three degenerating forms of *P. falciparum* found. Quinine bihydrochloride grs. 10 was injected. Evening temperature—97.6°F. General condition of the patient much improved. Blood examination—no parasites found after a prolonged search. Quinine bihydrochloride grs. 10 was injected.

31st October, 1936.—Morning temperature—96.4°F. Blood examination—no parasites found. She was advised to continue the following treatment:—Quinine bihydrochloride grs. 5 in capsules four times a day for four days. Alkaline mixture 20 minutes before each capsule.

After four days—quinine bihydrochloride grs. 5 twice a day morning and evening. Alkaline mixture thrice a day till the delivery of the child. Sodium sulphate and magnesium mixture one ounce when necessary.

She made a rapid recovery and gave birth to a healthy male child of 8 pounds on 16th January, 1937, without any trouble whatsoever.

The special features of this case are:—

1. There was no miscarriage in spite of pushing quinine in big doses daily (10 grs. quinine injection thrice daily, nine such injections in all).

2. The malaria parasites were increasing in numbers in spite of three injections of 10 grs. quinine daily and persisted until the sixth such injection, when they began to degenerate. This was confirmed by blood examination before each injection.

3. The patient gave birth to a healthy male child of 8 pounds weight without any complication about 2½ months after this acute attack of malaria.

I wish to thank Dr. Croft, the chief medical officer, Metalli, Dooars, for his help and valuable advice.



# A CASE OF ERYTHRODERMA DESQUAMATIVA (LEINER-MOUSSOUS) IN AN INDIAN CHILD

By K. LINDBERG

Medical Officer, Barsi Light Railway Company

CASES of erythroderma desquamativa in nurslings are not often met with, and as they present ætiological and therapeutical problems of great interest, the report of a recently observed case which showed unusual features seems fully justified. Moreover, as far as I know, no case of this disease has up till now been recorded from India.

## History of the case

A male infant was born as the fifth child to a Mohammedan brick-layer in the railway colony at Kurduvadi on 8th March, 1937. Its weight on 11th March was 6 lb. 10½ oz. and the child seemed healthy and well developed. The parents and the other children were in good health (one child had however died from extensive burns at the age of 2½ years) and there was nothing in their present or past history that had any bearing on the case under report. The child was breast fed from its birth and although the parents had been in the habit of giving opium to their first children this was not done, according to their statements, in the case of this child. The baby was seen again by a sub-assistant surgeon on infant welfare duty on 11th April and it was reported to be quite well and weighing 9 lb. 6 oz.; an increase of 2 lb. 11½ oz. in four weeks.

On 1st May, after having been advised to bring the child for vaccination, the father came to the dispensary without the baby and stated that the child was not in a fit condition to be vaccinated owing to a skin disease 'bran' (*bhusa*) having formed on its body. The father was then instructed to bring the child for examination.

A big, fat and plump baby, weighing 9 lb. 10 oz. was then produced, the skin had a markedly reddish hue and was tense and firm as if soaked with fluid but without pitting; its surface was dry and covered nearly everywhere by epidermic flakes, which were mostly large and partly detached. This condition, the erythema, the desquamation and the tenseness of the integuments, was generalized on the head, trunk and limbs, but the hands, both dorsal and palmar aspects, were entirely unaffected and the soles of the feet showed only slight erythema and desquamation. There was no raised zone of demarcation between the healthy and affected parts. The desquamated flakes were particularly large on the trunk, the scalp and the proximal parts or the limbs; the erythema appeared most intense on the same regions and the infiltration of the integument seemed most marked on the face, especially around the orbits and the mouth. The eyelids could not be completely closed and the child could not suck, not being able to move the lips freely. The penis and scrotum were also œdematous. There was no loss of hair on the scalp.

The rectal temperature was 100.2°F. The lungs were clear but the child was said to have been coughing a little for the last five or six days. There was some dyspnoea. The heart sounds were normal. The spleen was not palpable. The liver was enlarged and apparently tender, and reached two finger-breadths below the costal margin in the nipple line. The conjunctivæ were of a dirty greyish-yellow colour and showed a markedly dry aspect; there was also a lack of lustre of the corneæ.

According to the father the child had been quite well up to five or six days previously when redness and desquamation started on the scalp; it rapidly spread down the face and trunk, with the exception of the

hands and the soles of the feet, within the next three days. The child was said to have had some disturbance of the bowels during the five or six previous days but the parents were not explicit on this point. The father had procured castor oil from the village and administered it to his child one or two days before it was seen and stated that the bowels had been satisfactory afterwards. He said that no other treatment had been given. There had not been any vomiting; the child had had four diarrhœic stools since the previous evening.

The mother's milk was discontinued; a proprietary butter-milk preparation (Eledon 16 gm. to water 90 c.c.) was supplied and the mother was instructed to give as many teaspoonfuls as the child would take every second hour, haliverol one drop daily and calcium lactate 0.10 gm. thrice daily were prescribed; 0.5 per cent carbolic acid in olive oil was supplied for application twice daily, and the parents were asked not to use any water on the skin of their child.

The following day the general condition of the child was stationary; the rectal temperature remained at 100.3°F.; the erythema and tenseness were less marked and desquamated flakes removed through the oil application revealed almost healthy looking epidermis. The butter-milk mixture was rejected by the child and only water and a small amount of breast milk taken.

In the morning of 3rd May the temperature rose to 104.2°F.; there had been four loose stools, but no vomiting; dyspnoea was marked. A blood examination showed: hæmoglobin 75 per cent (Tallqvist scale); total white cells 12,000. Differential white cell count:

Neutrophiles	.. 77 per cent
Juveniles	.. 10.5 "
Stab forms	.. 40 "
Segmented forms	.. 26.5 "
Lymphocytes	.. 15.5 "
Mononuclears	.. 7.5 "

Two c.cm. of the mother's whole blood as advised by Petényi (1925) were then injected intramuscularly. In the evening the temperature rose to 105°F., and respirations were 80 per minute.

Early the following morning (4th May), the child was found semi-conscious with eyeballs turned upwards and showing deep icterus of the scleræ. The lungs were clear; heart sounds weak and slow. The lower margin of the liver was now felt at the level of the umbilicus in the nipple line. The spleen was not enlarged. There had been two diarrhœic stools and no vomiting.

Urine was passed spontaneously during the examination and was received directly in a glass. It was clear, deep orange yellow with a greenish foam, of acid reaction. The following tests were carried out:

Gmelin + +. Benedict—green precipitate. Urobilinogen—negative. Indican—negative. Albumin—trace. Sediment: Epithelial cells—(some of 'renal' type); a few granular casts, erythrocytes very scanty.

The stool specimen was loose, greenish, fæcal and showed very numerous neutral fat globules, neutral fat flakes and a moderate amount of fatty acid crystals. There were no leucocytes.

The child died early in the afternoon of the same day. A post-mortem examination was refused by the parents.

## Discussion

There seems to be no doubt that the case was one of erythema desquamativa, Leiner-Moussous. The age of the baby (two months), the non-occurrence of vesicles or bullæ and the presence of constitutional symptoms differentiated it from the dermatitis exfoliativa neonatorum of Ritter von Rittersheim. The absence of marked temperature up to the day before the fatal termination together with the

comparatively slight systemic disturbance during the first three days of observation and the mode of extension of the cutaneous condition seemed to exclude erysipelas. As already mentioned there was no history of any toxic remedy having been given to the child previous to its illness.

It is proposed to examine briefly whether the scanty and incomplete data furnished by the present case lend any support to one or other of the two main theories put forward to explain cases of erythroderma desquamativa.

I. *Avitaminosis theory*.—Cases of erythroderma desquamativa accompanied by keratomalacia and xerosis have been reported especially in Germany during the years that followed the war, but such coexistence does not seem to have been observed with any frequency in countries where vitamin-A deficiency is common. Although xerosis was evident in the present case when the baby was seen at the height of the illness, the child was apparently in perfect health and development up to the time of the acute onset of the illness and, considering the rare occurrence of xerosis in babies at Kurduvadi, it is believed that deficiency of vitamin A was not likely to be at the origin of the illness in this case but was probably a result of the hepatic involvement, the liver being known as the storage organ of this vitamin. I have elsewhere drawn attention to the relationship between vitamin-A deficiency and disease of the liver (Lindberg, 1935).

E. Moro, the authority on eczema seborrhoicum, is said to consider erythema desquamativa to be due to a vitamin-H deficiency, apparently from a mainly anatomopathological reasoning as no doubt there is a disturbed secretion of the sebaceous glands in both the conditions. The available information on this vitamin is however still too scanty to allow a discussion of this theory.

II. *Theory of intestinal toxæmia*.—As the disease is observed practically only during the first three months of life it is evident that the great majority of the cases have been reported in breast-fed babies. Erythema desquamativa has however in fairly numerous instances been seen in artificially-fed babies as well, the percentage of cases in such babies varying from 5 (Leiner) to 16 per cent in the series of various authors. This fact would indicate that the noxious agent is not necessarily of a purely endogenous nature but may primarily originate from the outside world.

It is not difficult to conceive why cases of erythroderma desquamativa are limited to the first few months of life. The delicate structure of the epidermis, its incomplete cornification and the abundance of capillaries in the papillary layer make the skin of young nurslings exceedingly sensitive and explain the rapid extension of the disease; further, the tendency to seborrhœa commonly present during the first weeks of life and the incomplete development of

the sweat glands would favour any desquamative process. The water balance disturbance evidenced by the infiltration of the integument is a sign that has been frequently noted as well as a tendency to anæmia.

Noxious agents are of course particularly likely to gain entry through the mucous membrane of the intestines owing to its great vulnerability during the first months of life. Hill (1934) says 'dyspepsia' and diarrhœa are said to be constant features in cases of erythroderma desquamativa and the development of alimentary toxæmia (the 'exsiccation toxicosis of nurslings' of American writers) during or after its course has been noted by several authors. The occurrence of dehydration can be understood both as a result of the diarrhœa and the hydrolability already referred to, fluid being drained from parenchymatous organs and retained in the corium.

The clinical picture of alimentary toxæmia was nearly complete in the present case, with diarrhœa, disturbed consciousness, dyspnoea and enlargement of the liver. As far as I can find from the literature at my disposal the occurrence of jaundice has however not been noted in other cases. For some reason there was during the third day of observation a sudden increase, quantitative or qualitative, of the toxic agents or a sudden breakdown of what remained of the defensive mechanism of the body with consequent fever, further involvement of the liver as translated by further increase in size, jaundice, choluria and presumably guanidinæmia followed by rapid coma and death.

Clinical descriptions of cases of erythroderma desquamativa show somewhat variable features and one is tempted to believe that the noxæ causing this syndrome may be of different natures. Skin reactions are rarely specific and owing to constitutional peculiarities, the nature of which can seldom be determined, the skin may react in a certain and similar way to stimuli which may be physically or chemically different.

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[Note.—Erythroderma desquamativa is not a term used by British dermatologists, as far as we are aware, and the condition would appear to fall into the group of allergic dermatitis of infants. In a young breast-fed child the exciting agent is probably a foreign substance in the mother's milk. Death occasionally occurs in children with allergic dermatitis, without any cause being obvious, but it probably always means that the child is suffering from some serious disease of the intestinal organs, especially the liver, which has not been diagnosed, and the present case suggests this explanation of the child's death.—EDITOR, I. M. G.]

# Indian Medical Gazette

DECEMBER

## SULPHANILAMIDE: THE SECOND PHASE

IN these days when almost every mail brings with it news of the introduction of some active and powerful drug for our use, we should continually remind ourselves that such drugs, though they may have been tried in some dozens or even hundreds of cases, are essentially in their under-trial stage, and have not, like our pharmacopœial drugs, been tested, not in hundreds only, but in hundreds of thousands of individuals in various states of health, over long and short periods, in large and small doses, and in innumerable combinations with other drugs. If we do not remember this ourselves we are liable to be reminded by receiving unpleasant shocks in our own experience.

In our August issue we drew attention to the very promising results that had been obtained with sulphaniilamide in the treatment of streptococcal and certain other bacterial infections, but we did temper our enthusiasm by the statement that 'it is as yet too early to state categorically that they are harmless when administered over long periods'. Although hitherto nothing more serious than sulphæmoglobinæmia had been reported, at the time we were writing this, there were actually in the post some half a dozen reports of serious consequences associated with the taking of sulphaniilamide or similar compounds. Many of the benzene-ring compounds closely allied to sulphaniilamide, e.g., benzol and toluol, are recognized as powerful bone-marrow poisons, and some of them have been used medicinally to depress bone-marrow function in such conditions as leukæmia and polycythæmia; experienced physicians who have been using sulphaniilamide have therefore been on the lookout for signs of hæmopoietic dysfunction in their patients. Already, during the last few months, a considerable number of such cases has been observed. In our last issue we reprinted from the *Journal of American Medical Association* a report on three cases of acute hæmolytic anæmia associated with sulphaniilamide administration; though all three patients were seriously ill they recovered. In the September 25th issue of the same journal there were eleven contributions on the use of sulphaniilamide in nine of which toxic effects were reported; the cases reported included another of acute hæmolytic anæmia and one of optic neuritis, but the majority were cases with skin manifestations, dermatitis and papular and macular rashes, often accompanied by high fever and general malaise.

In a number of these there was evidence that the skin manifestations were precipitated or at least increased by exposure to the sun.

Far more serious have been the cases of agranulocytosis that have been attributed to the taking of this drug; there are at least four reports of such cases ending fatally, and a fifth in which recovery followed complete granulopenia on discontinuance of the drug and administration of pentnucleotide and campolon. In a recent issue of the *Lancet*, there is a report on three cases of an aplastic type of anæmia, none of serious consequence, though one patient who was anæmic from the outset was given a blood transfusion.

In the public press we have recently read a story of a proprietary elixir of sulphaniilamide that caused a number of deaths amongst those who took it. This last incident stands out alone, as it is obvious that it was not the sulphaniilamide itself that caused the trouble but the substance or substances with which it was mixed to constitute the elixir, and it exemplifies the risk that members of the public undergo when they purchase untested proprietary preparations directly from the chemist, and take them without medical advice.

Most of the persons suffering from these toxic manifestations had been receiving large but not unusually large doses and in a few the symptoms occurred early in the treatment, before even an average dose had been taken; that is to say, the occurrence of symptoms cannot be strictly correlated with the dosage. It has been known that sulphæmoglobinæmia and the accompanying symptoms, cyanosis, etc., are more likely to occur if the patient is taking some other sulphur-containing substance, for example one of the otherwise innocuous purgative sulphate salts, and it seems very probable that in many of the instances where toxic symptoms have occurred some other incompatible—in the widest sense—medicament was being taken, though up to the present it has not been possible to incriminate any particular one.

One of the greatest dangers appears to arise from possible unguided self-medication by patients who, with no knowledge of their action, have little difficulty in purchasing from their chemist sulphaniilamide or any of the proprietary preparations containing it or allied substances; this is particularly likely to occur when patients are suffering from a disease such as gonorrhœa about which they hesitate to consult their own physicians. There is also some danger, we fear, from over-enthusiastic and ill-advised administration by the medical profession in conditions in which they are unnecessary or of doubtful value; sulphaniilamide is already being extensively used as a prophylactic in obstetric practice; in our present state of incomplete knowledge, it seems doubtful to us if this is justifiable, and certainly not unless the patient is under constant medical supervision. The dangers of inducing agrani<sup>1</sup>



the child-welfare service but it has not yet been laid down that the teachers in charge of those schools should have any specialized training. From the preventive medicine point of view it is most essential that these teachers should have a training in child psychology as well as in the physical care of toddlers. At present in England there is a certain amount of dispute going on between the Ministry of Health and the nursery schools association of Great Britain as to whether specially trained women are necessary for work in nursery schools. The association maintains that specially trained nursery school teachers should be employed and that nursery schools should be made part of the permanent educational system of the country, and should not be provided to promote the physical well-being only of children but their all round normal development, both physical and mental. The Ministry of Health is not prepared to accept this principle and holds the nursery school to be part of the welfare service to safeguard the physical health of the toddler.

This introduction is just to show you the place the subject of my lecture may hold in the future developments of public health. I further want to say that the lecture was written entirely in relation to the upbringing and education of children in the west, as I have not sufficient experience of the attitude towards sex in relation to very young children in Indian homes to be able to speak about conditions in this country. I must ask you from your own knowledge to apply what I have to say, in so far as it is applicable, to conditions in this country. Further, I would like to add that this lecture was written for quite a different type of audience and has only been rather hastily modified before being delivered to this learned society. If therefore it is in some respects not altogether suitable, I must ask your indulgence.

If the title of my lecture suggests that teaching about sex should be given as a separate educational subject in schools, then the title conveys a wrong impression. What I have to make clear in it is that knowledge of the facts of sex should not be denied to children, and such knowledge should be made accessible to them as they acquire it in a natural way. Separate set lessons on sex would be unnatural, for the sex function is only one of the many functions of the human body, which should be studied as a whole in physiology or biology classes. The reason why I have to speak to you on sex instruction, separating it artificially from the wholeness of human physiology and psychology, is because many people have been subjected to an education and upbringing from which all knowledge of sex was rigorously and artificially excluded. This type of upbringing produces repressions regarding sex and makes it difficult for people so brought up to take a balanced view of it. Many realize that their

upbringing from this point of view was not good, and feel that they would like the children of the next generation to be brought up differently; but, suffering from the disabilities of their own upbringing, parents find it difficult to speak naturally about sex to their children. In spite of their desire to the contrary they are only too apt to pass on their repression to their children.

Now what do I mean when I say that sex knowledge is artificially and unnaturally excluded from the old-fashioned type of education. It is natural for the small child to ask questions without end, and the question 'where do babies come from?' is one that is almost invariably asked somewhere between the age of two and four. In the type of upbringing I condemn, this question and others of the same kind are hushed up or are answered by untruths. This is surely unnatural and also wrong.

The next period of the child's upbringing begins when he goes to school. If he goes to a school where science is taught he will learn about the structure and functions of living things, plants and animals, and later on he may learn human physiology and hygiene. In those lessons the child will learn exactly how plants and the lower animals reproduce themselves, but the nearer he gets to the human species the more obscure and indefinite will information regarding the reproductive system become. If we examine school books on human physiology we find that all reference to the genital system is omitted. Such omission of matters of fact from a supposedly scientific study cannot be justified.

Turning to adult education we find here the same state of affairs, even medical students are not given the opportunity to read in their textbooks of physiology an account of the mechanism of the sexual act. In my time as a student the psychology of sex was barely touched on, and students qualified as doctors were quite unfitted to help patients who might appeal to them for advice about sexual difficulties. They also completely lacked the scientific training in this aspect of physiology and psychology which would have helped them to suspect and diagnose sexual difficulties, which patients seldom like to speak about unless directly asked. If it be folly to discourage the scientific study of one system of the body among school children and ordinary science students, surely it is the height of folly to discourage it among medical students in whose hands are placed the future bodily and mental health of the community. This obscurantist attitude to sex is easily recognized as foolish in the case of the medical profession, but it is not so easy to realize that it is equally foolish all through life and that it is during the first five years of life that the seeds which produce this attitude towards sex are sown. It grows from

cytosis and anæmia make it advisable that the blood of all patients receiving full doses of these drugs should be repeatedly examined. And, finally, all patients should be warned, particularly in a tropical country, to avoid the direct rays of the sun as much as possible while they are under treatment.

Whilst these untoward incidents that have been associated with the taking of sulphanilamide should be a warning to the over-enthusiastic, it would be a great pity if they were to deter the cautious practitioner from giving this apparently very valuable drug in cases in which it is clearly indicated.

## Special Article

### SEX EDUCATION\*

By JEAN BIGGAR, M.B., CH.B. (Edin.)

'SEX EDUCATION' has a definite rôle to play in the sphere of preventive medicine. The recent findings of child psychology show that the development of the sex instinct is affected by the attitude of the parents towards sex and by their giving of or by their denial of sex instruction in early childhood. It is now accepted that the correct attitude in the home and the willingness of parents to answer truthfully the sex questions of young children aged two to five play a most important part in promoting the mental health and balance of the adult, whereas a repressive attitude in the home towards sex sows the seeds of future neurotic illness. These findings, first put forward by Freud as a result of his analysis of psychopathic adults, were at first widely disputed, but I think it may be truthfully said to-day that they are everywhere accepted by psychologists, although not necessarily in the exact form given them by Freudians. Freud's findings led to an intensive study of child psychology. To the astonishment of many observers much of what Freud had concluded to be true of the development of the sex instinct, as a result of his analysis of neurotic patients, was actually to be found in the normal child's life when it was observed with a critical and scientific eye in the light of Freud's theory. Whether the whole findings of Freud are accepted or not no one can deny to-day that the seeds of future neurotic illness are sown in childhood. If it may be said that the whole of preventive medicine is a field for public health activities undoubtedly the guidance of the development of the sex instinct in childhood should be included in that sphere. It need only be remembered that about one-third of the illnesses for which patients in England draw sickness benefit under the medical insurance acts are neurotic or psychological in origin to realize the necessity of the application of preventive measures against psychological as well as against physical illness, if the community is to be maintained in full health.

How exactly guidance of the development of the sex instinct or indeed child psychology at

all can be brought within the sphere of public health is another matter. In America and England and other western countries the idea is becoming widely accepted that the child should be cared for from the time of conception up to school age through the maternity and child-welfare service. Till recently the child-welfare service proper catered only for the first two years of life, but there is now a movement to carry the care of the child right on up to school age, so that there may be no break between the care of the child provided by the welfare service and the beginning of the care provided by the school medical inspection service. In child welfare, clinic doctors are paying more attention than formerly to the psychological factor in child development which is found to be almost inseparable from the physical. For the age period two to seven years, it is advocated that children should be cared for in nursery schools provided by the state. The necessity for the provision of this service has been accepted in principle by the Ministry of Health in England. Russia is I believe the only country where great progress in the provision of nursery schools and crèches has been made. The need for these schools under modern conditions of life arises partly because of the large numbers of children growing up in cities in cramped surroundings which give them no outlet for play or free development, and partly because of the increasing numbers of small families in which there are only one, two or three children born at long intervals, the children thus being deprived of the opportunities for social development found in large families. The nursery school is therefore advocated :—

- (a) to give the child healthy surroundings,
- (b) to promote his physical development,
- (c) to promote his social development by placing him amongst children of his own age; and
- (d) to guide his psychological development during the early formative years.

It is through nursery schools that the normal development of the sex instinct may be safeguarded by the public health service of the future which will have a psychological as well as a physical outlook. It has been recognized in England by the Ministry of Health that nursery schools should be provided as part of

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the child-welfare service but it has not yet been laid down that the teachers in charge of those schools should have any specialized training. From the preventive medicine point of view it is most essential that these teachers should have a training in child psychology as well as in the physical care of toddlers. At present in England there is a certain amount of dispute going on between the Ministry of Health and the nursery schools association of Great Britain as to whether specially trained women are necessary for work in nursery schools. The association maintains that specially trained nursery school teachers should be employed and that nursery schools should be made part of the permanent educational system of the country, and should not be provided to promote the physical well-being only of children but their all round normal development, both physical and mental. The Ministry of Health is not prepared to accept this principle and holds the nursery school to be part of the welfare service to safeguard the physical health of the toddler.

This introduction is just to show you the place the subject of my lecture may hold in the future developments of public health. I further want to say that the lecture was written entirely in relation to the upbringing and education of children in the west, as I have not sufficient experience of the attitude towards sex in relation to very young children in Indian homes to be able to speak about conditions in this country. I must ask you from your own knowledge to apply what I have to say, in so far as it is applicable, to conditions in this country. Further, I would like to add that this lecture was written for quite a different type of audience and has only been rather hastily modified before being delivered to this learned society. If therefore it is in some respects not altogether suitable, I must ask your indulgence.

If the title of my lecture suggests that teaching about sex should be given as a separate educational subject in schools, then the title conveys a wrong impression. What I have to make clear in it is that knowledge of the facts of sex should not be denied to children, and such knowledge should be made accessible to them as they acquire it in a natural way. Separate set lessons on sex would be unnatural, for the sex function is only one of the many functions of the human body, which should be studied as a whole in physiology or biology classes. The reason why I have to speak to you on sex instruction, separating it artificially from the wholeness of human physiology and psychology, is because many people have been subjected to an education and upbringing from which all knowledge of sex was rigorously and artificially excluded. This type of upbringing produces repressions regarding sex and makes it difficult for people so brought up to take a balanced view of it. Many realize that their

upbringing from this point of view was not good, and feel that they would like the children of the next generation to be brought up differently; but, suffering from the disabilities of their own upbringing, parents find it difficult to speak naturally about sex to their children. In spite of their desire to the contrary they are only too apt to pass on their repression to their children.

Now what do I mean when I say that sex knowledge is artificially and unnaturally excluded from the old-fashioned type of education. It is natural for the small child to ask questions without end, and the question 'where do babies come from?' is one that is almost invariably asked somewhere between the age of two and four. In the type of upbringing I condemn, this question and others of the same kind are hushed up or are answered by untruths. This is surely unnatural and also wrong.

The next period of the child's upbringing begins when he goes to school. If he goes to a school where science is taught he will learn about the structure and functions of living things, plants and animals, and later on he may learn human physiology and hygiene. In those lessons the child will learn exactly how plants and the lower animals reproduce themselves, but the nearer he gets to the human species the more obscure and indefinite will information regarding the reproductive system become. If we examine school books on human physiology we find that all reference to the genital system is omitted. Such omission of matters of fact from a supposedly scientific study cannot be justified.

Turning to adult education we find here the same state of affairs, even medical students are not given the opportunity to read in their textbooks of physiology an account of the mechanism of the sexual act. In my time as a student the psychology of sex was barely touched on, and students qualified as doctors were quite unfitted to help patients who might appeal to them for advice about sexual difficulties. They also completely lacked the scientific training in this aspect of physiology and psychology which would have helped them to suspect and diagnose sexual difficulties, which patients seldom like to speak about unless directly asked. If it be folly to discourage the scientific study of one system of the body among school children and ordinary science students, surely it is the height of folly to discourage it among medical students in whose hands are placed the future bodily and mental health of the community. This obscurantist attitude to sex is easily recognized as foolish in the case of the medical profession, but it is not so easy to realize that it is equally foolish all through life and that it is during the first five years of life that the seeds which produce this attitude towards sex are sown. It grows from

seeds of shame and fear planted in the minds of young children by their mothers or those who stand to them in the place of mothers. The children are made to feel that there is a dark mystery in their bodies and about the origin of life, a mystery both horrifying and mysteriously fascinating. To be fascinated by that which they have been made to feel is shameful terrifies children, especially the more sensitive and intelligent ones, and they repress and deny all sex interest, and at the same time are driven to hate and fear their bodies, especially those parts of the bodies concerned with reproduction. This repression of the natural interest in sex persists throughout life. It is very difficult for people with this repression to read about sex or study it in a dispassionate way; they have the persistent feeling that it is shameful to look at or think about or take any interest in such things. This attitude rules out scientific study which demands a dispassionate and clear-sighted ability to look at facts.

How then can this vicious circle be broken and the children of to-day be given the freedom of mind denied to many of the older generation. First by re-education, parents and teachers must be intellectually convinced that it is right and beneficial to allow the child sex information and then they must resolve to live up to intellectual convictions. Where intellect is at war with long-felt prejudice and false shame this is by no means easy to do, but requires courage and resolution. The first step is the most difficult, but, if that is once successfully surmounted, it becomes easier. The small child's completely natural attitude helps and enlightens the mother who tries to answer all his questions naturally and truthfully. She soon realizes how lovely the human spirit uncontaminated by shame can be. She rejoices that she has been able to take the way to preserve this loveliness which is the true 'innocence' of childhood.

Parents sometimes ask whether information about sex should be given by the parents in the home or by the teachers in the school. The answer is that the right time to give the knowledge is when the children first ask for it. As we have seen already the first questions are usually asked in the third and fourth years, that is before school age, and therefore they must be answered by the parents. Not only is this age the time when the child first asks about sex, it is also the time when his emotional attitude to sex is formed. It is therefore more important that questions should be answered truthfully at this than at any later time. Child psychology shows us that this is the time when the child's character is formed, now his whole future life is being moulded. His reaction to his parents' attitude towards sex, as shown in their lives and in their method of dealing with his questions, has a profound influence on his future character. Instruction given later in life in school cannot wholly correct the evils brought

about by wrong answers given or wrong impressions made during the formative early period of life.

There are many parents who say, 'But my child has never asked me any sex questions'. Such parents do not realize that the child's ability to ask these questions depends on factors operating before the age of two. Although the child cannot ask questions before two, yet from a much earlier age he has taken an interest in his own body, and in his bodily functions including the excretory functions. If this interest is checked, if the child is told such interest is 'dirty', or that his excretory products are 'dirty', or if his interest in his parents' bodies or the bodies of other children is discouraged, then the process of repression has already begun. Sometimes mothers think they ought to answer sex questions and yet dread them, and when the child gets near the subject there comes a change in the tone of her voice which the child feels, and he does not ask because he feels that his mother does not like these questions. The same tone used about the excretory functions will be carried over in the child's feeling to the genital organs, for he does not distinguish between the genital and excretory organs. If therefore the child is made to feel that there is something disgusting about his excretory organs, this false feeling of disgust will be carried over to the genital organs. Children who have thus early been repressed often fail to ask sex questions. If such questions are to be asked there must be complete confidence between mother and child, and to secure that the mother must understand how the child feels about his body, so that she may not unknowingly spoil his feeling. The attitude of the unspoiled child to the excretory processes is well illustrated in the following story from 'New Babes for Old', a book by Dr. Winifred de Kok. She relates how her little daughter, two years old, came into the room where her mother was changing a napkin which the new baby brother had soiled. At first the mother was put out, for she did not want the little girl to see the baby's excretions, thinking the child might find it disgusting, and not love the baby so well thereafter. However, she did not say anything to the child but let her watch what she was doing. The little girl pointed to the bright yellow motion on the baby's napkin and smilingly exclaimed 'Pretty, pretty sunflower'. The mother then felt thankful that she had not imparted to the child any feeling of disgust which it was obvious it would have been quite unnatural for her to feel.

When mothers say therefore that their children never ask them any sex questions I know that these children have in some ways been repressed. They may have been subjected to too strict training in control of the bladder and bowel; or after failure of such control they may have been called 'dirty'; or they may have been made to feel that there is something shameful in nakedness. The most important thing for the small

child is the love and approval of his mother. He will go without knowledge and give up his own feeling for truth if 'need be to gain her approval. Thus it is that the mother's attitude so easily produces repressions, and why it is the mother who is usually responsible for them. If a mother feels shame about the bodily functions she will impart her feeling to her child and he will repress his interest in those functions for fear of losing her love.

If however the child is not so repressed he will inevitably sooner or later ask 'Where do babies come from?' Mr. Maiti, in an interesting lecture, 'Children's Questions', pointed out that the child's questions are never asked purely for intellectual reasons, but that they always have roots in the child's emotional life as well. When the little boy asks 'Where do babies come from?' he asks, not only because he wants to know as a matter of intellectual knowledge, but also because the advent of a new baby in his home is both feared and desired. His emotions are involved. Perhaps he wants to know because he may fear that another baby will come and take his mother's love away from him; or perhaps because he feels that there is a love between his father and mother from which he is excluded and which he cannot understand. He may feel unsafe in the family relationship and want to be reassured. The best way for the mother to help the child to feel secure is to give truthful answers to all his questions. By so doing she will help him to feel that he is not shut out, and that he will not lose her love even should another baby come. By telling him beforehand that another baby is coming she will help him to accept the fact that he must share her love. The lesson that one cannot have an exclusive right to the love of any human being is a hard one to learn, but it is one that must be learned and mothers can do much to help their children to accept it easily. The only child stands at a disadvantage because he does not get the opportunity to learn this lesson in the formative period of his life.

So far I have said that it is necessary to answer a child's questions about sex truthfully because on so doing depends the child's future attitude towards sex. But of course there are other reasons why these questions should be answered truthfully. The first reason which I have just been explaining may be called 'the emotional reason'; the second reason is the 'intellectual one'. If questions about sex are repressed the child may get the idea that it is wrong to ask questions, and this will retard his intellectual development. Also if he is made to feel that it is wrong to think about certain things, this feeling of wrongness may spread to other subjects such as mathematics, so that the repressions of a child's questions about sex may produce repression of the intellectual as well as of the emotional side of his character. The third reason why questions should be

answered truthfully is ethical. Although everyone is convinced that one of the greatest human virtues is truth yet many parents and teachers who believe this think it no shame to lie to children. We have seen already that the small child develops his emotional attitude from his mother. In the same way his feeling for truth is derived from his mother. If she lies to him his feeling for truth becomes impaired. For all these reasons when the child asks 'Where do babies come from?' it is wrong to answer that they are brought by a stork or that the doctor brings them in his bag, or by any other of the fairy tales with which parents too often answer this question. The child seemingly accepts the story told him but deep down in him there is a feeling which tells him that the story is not true even though he may consciously accept it.

The following is a true story about a small boy who had been told untruths about the birth of his little sister. The incident occurred when he was about four years old and had been sent away from home to stay for a time with friends. The mother of the family to whom he had been sent had three children of her own, one of whom was a baby, and all were younger than the visitor. She was a modern mother and had resolved that whatever questions her children asked should be truthfully answered, although she had often wondered how she would answer sex questions. As it happened her first experience came with this little stranger child. One day he said to her 'we got a present of a calf at home; was your calf a present?' She replied 'no it was not a present, the calf came out of the cow'. Another day the child said 'We have a present of a baby at our home, the doctor brought it to us; did the doctor bring you your baby?' And she replied 'No, my baby came out of me'. In telling me this story the mother said she had felt so indignant that the little boy had been told such lies, that she answered frankly and naturally. This tale shows that the little boy had not really believed what his mother had told him, and that he was taking the opportunity to test what she had said.

Here is another story of a family in which the children had not asked any questions about sex, although the mother had been quite prepared to answer such questions truthfully. Yet in her dealings with her children there was a subtle change in her voice whenever the children asked questions relating to the excretory functions, and she often checked them when they referred loudly and clearly to these functions in the way that children do. I stayed with this family for several months and made great friends with the children. One evening the little boy aged five and the little girl aged three came into my room when I was having my bath. I could not help feeling slightly embarrassed at this intrusion into my privacy, but I realized that this was a wrong feeling and that

seeds of shame and fear planted in the minds of young children by their mothers or those who stand to them in the place of mothers. The children are made to feel that there is a dark mystery in their bodies and about the origin of life, a mystery both horrifying and mysteriously fascinating. To be fascinated by that which they have been made to feel is shameful terrifies children, especially the more sensitive and intelligent ones, and they repress and deny all sex interest, and at the same time are driven to hate and fear their bodies, especially those parts of the bodies concerned with reproduction. This repression of the natural interest in sex persists throughout life. It is very difficult for people with this repression to read about sex or study it in a dispassionate way; they have the persistent feeling that it is shameful to look at or think about or take any interest in such things. This attitude rules out scientific study which demands a dispassionate and clear-sighted ability to look at facts.

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to have babies and to nurse them and that men don't share in this responsibility. I have known a number of small boys who were very upset when they discovered that they would not be able to produce babies themselves when they grew up. They are also disappointed when they are told that they will not have any milk in their breasts. One small boy watched his mother nursing the baby and said 'When I am grown up I shall have lots and lots of milk in my breasts'. The same child said rather wistfully 'When I was a baby, did you give me milk like that?' As it happened he had been mismanaged and half-starved during the first six months of his life and I feel sure there was an emotional need behind that question. Freud lays great stress on the part played in the girl's psychological development by her envy of her brother's genital organ. I am inclined to think that an equal, if not greater, effect is produced in a boy's psychology, when he discovers that he cannot be a mother.

The following is an account of the sex questions asked by an English girl brought up in India. She was the eldest child. At the age of two years and nine months she saw her mother knitting and asked her what she was making. Her mother told her she was making a coat for a new baby that was coming to live with them. The little girl Ann at once said, 'I got lots of coats', and went to her cupboard and proceeded to try on every coat that she could find regardless of the high temperature—100°F. Some days later she said suddenly 'When I am big I shall have a baby in my tummy'. When she was three years and three months old her mother had twin babies, both boys. At first Ann was delighted and showed no signs of jealousy. Two months later the twin babies were ill and her mother could pay Ann very little attention. Ann became very difficult and delighted in making scenes, and openly declared several times that she hated the babies and wished that they would go away or die. About the same time Ann came to her mother almost beside herself with rage and said, 'My ayah tells me that the babies came in a parcel from Granny and my ayah is wrong'. It took her mother some time to pacify her. It is very usual for children who have been told the truth to resent strongly any subsequent effort to mislead them. At the same age, three years and five months, Ann asked 'Did you mean to have two babies or was it a mistake?' One day her mother was showing her a little book about the visit of the shepherds to the manger. She listened enthralled until they came to the first picture of the Baby Jesus, then she said firmly, 'I don't think I like about little babies'. A month later when Ann was 3½ her grandparents came to stay at her home and made a great fuss of her and did not like the wailing, sickly twin babies so much. From the day they arrived Ann's behaviour began to improve and she began to enjoy the

twins again. At the age of four years she went to a wedding and asked why the bride and bridegroom were going to be married. Her mother replied because they loved each other and wanted to have a house of their own and perhaps after a time they would have a baby. Ann asked, 'Oh, will the baby be a bit like Aunt A and a bit like Uncle B?' When she was four years and four months old she asked 'Can babies just have mummies or must they have daddies too?' Her mother said that they must have fathers too and Ann asked why. Her mother explained that the speck of jelly inside the mother from which the baby grows does not begin to grow until a speck of jelly from the father is joined on to it. When Ann was five her cat had kittens, and she noticed that the cat was in discomfort the day the kittens arrived. The next day she asked her mother if the kittens hurt the cat when they were born, and if it had hurt her mother when she was born. Her mother replied 'It did hurt a bit for both of us but the part I remember best was being so pleased to see you'. Ann laughed and thought that was very funny. At the age of six years and eleven months Ann asked how and where the father's seed united with the mother's seed to make a baby. After her mother had explained that to her she asked if a baby began to grow every time the father's seed was put inside the mother. At the age of seven years and one month she told her mother that a little girl with whom she played thought that babies came down the chimney, and that this child's mother got 'kind of cross' when she asked her questions about them. Ann's mother asked if she told the other child what she knew about babies. Ann replied 'No, she seemed a bit funny and I don't think she really wanted to know'. She then asked 'What happens to children whose mothers don't tell them true things? Do they grow up not knowing?' Her mother said that sometimes other people told them or they read about things. Ann said 'I am glad you tell me things or else I might get in a muddle'.

The above description of children's questions has been given in detail to show you the kind of questions uninhibited children ask. If children are to be separated from their parents for the greater part of the day between the ages of two and seven, as they would be if they attended nursery schools, the nursery school teacher must be prepared to answer these questions truthfully and it is necessary for the children's best psychological development that they should so answer them. It is most important that the teacher should not be suffering from repressions or a distorted attitude towards sex. The nursery school provides an environment in which town children can learn something of the lives of plants and animals; gardening and the care of pets are essential activities of the nursery school. The care of animals will help children to satisfy sex curiosity



I must not show it to the children because we were great friends. The little girls asked me several searching anatomical questions, also why I had no children, which I answered as best I could. Then she said, with a delightful old-fashioned turn of speech, 'What is all this business of being married and not being married and of having babies and not having babies?' At this point the mother realized where the children were and called them away, seemingly rather shocked. Afterwards I told her the questions her little girl had asked me and she exclaimed, 'Fancy, I never realized that Mary thought about such things'.

Now I shall give you an account of questions asked by a little boy, whose mother had been perfectly natural and frank with him always. They will show that the information that babies are made inside their mothers is not the only information the child requires regarding sex and that it is not enough to satisfy him. If he is allowed to, he will go on asking questions until he gets an explanation of the father's part as well. I again emphasize that those further questions will only be asked if the mother answers the first questions freely and without embarrassment.

This little boy, whom we will call John, was the second child of a family of four boys. He was brought up on a farm where he had many opportunities to see the reproductive and sexual processes in animals. He knew from the age of three, when his youngest brother was born, that babies were made inside their mothers, and he accepted this as a matter of course, and had not at that time shown much curiosity. When he was four years old he began to ask many questions about sex. His mother wrote me the following account of these questions.

John keeps plying me with questions about all kinds of things, lambs inside sheep, and babies inside their mothers. I said in a rash moment that the baby lived in a place like a little house inside his mother. 'Oh', said John, 'did I sleep on a bed in that little house inside you?' 'Oh, no, but you were very comfortable, you were in a kind of bath I think'. 'Was the water warm?' 'Yes, it was warm'. 'And did I get food?' 'Yes, certainly'. 'And did I wet inside you?' 'Well, not in the way you do now', I replied. 'Oh, and what was wrong and why didn't I?' Here I thought to myself—'insatiable child'. He continued 'Was William (his younger brother) there?' 'Not then'. He then asked if the other younger brother had been there at the same time and on being told 'No', he asked whether his elder brother had been there at the same time and I told him no, he had come out already. Another day he asked why he had not got milk in his breasts. I replied 'Because you are going to be a man when you grow up', then he asked if Winnie, his nurse, had milk in her breasts. I replied, 'No, she hasn't because she has not got a baby'. He asked, 'Why hasn't she got

a baby?' I replied, 'Because she is not married'. He then said 'Are you married?' to which I replied, 'Yes'. Other questions he asked at this time were 'Why have I bones?' 'Why do rams not have lambs?' 'Do cheviot sheep have cheviot lambs?' and so on.

A month or two later his mother wrote again saying John's questions have been persistent. The cows are always going to the bull; we have two red cows and one had a black calf and the other had a red, and John asked why was this and why were they not both red. I answered 'Well, one cow went to a red bull and the other went to a black bull'. Another day he saw the cock mounting the hens; when I killed a cock and was cleaning it John wanted to be shown what it was that the cock gave to the hens. Another night when I was putting him to bed John asked, 'Why are not babies inside men?' I answered 'Men give babies to women'. 'Where does a man put them?' he asked. 'Inside a woman beside the little house where babies grow'. 'What does the man put there?' I replied 'Something like a very tiny bit of jelly'. 'How?' he began, when we were interrupted. The next evening at bedtime he told me quite correctly why one calf was black and the other red. Five days later John asked what his testicles were for. I replied that all men had them. He said 'You haven't?' I replied 'No, because I am a woman'. 'Oh but why mother?' he asked. I replied 'The testicles are where the man keeps the seed he gives a woman to make a baby grow'. 'I haven't got seed' John said. I replied, 'Not yet but you will have when you grow up'. John said, 'But how does the man get the seed out, it will hurt him?' 'No', I said, 'It does not hurt'. 'But how does he put it inside the woman?' I said, 'By the penis'. 'Where does he put it in her?' 'Right up to where the little house is and there it will grow'. 'And be a baby?' 'Yes'. 'Will it sleep all the time?' 'Yes'. 'Doesn't it hurt the penis putting the seed in?' 'No, it doesn't hurt'. 'Won't the seed fall out again?' 'Oh, no'.

You will see from these questions what very detailed information children really want. You will notice also the confusion in the child's mind about the difference between the sexes. As it happened he had had no opportunity of playing with little girls and the only women he knew were his own mother and the nurse. But it is well to remember that children have got to learn the difference between boys and girls, and the fact that girls grow up to be women and that boys grow up to be men. They don't know this as a matter of course without learning it.

Thus an important part of sex education is to give the child opportunities to see other children and grown-up people, both men and women, naked. Even if they learn the difference between the sexes, still they may not realize that it is the function of women only



to have babies and to nurse them and that men don't share in this responsibility. I have known a number of small boys who were very upset when they discovered that they would not be able to produce babies themselves when they grew up. They are also disappointed when they are told that they will not have any milk in their breasts. One small boy watched his mother nursing the baby and said 'When I am grown up I shall have lots and lots of milk in my breasts'. The same child said rather wistfully 'When I was a baby, did you give me milk like that?' As it happened he had been mismanaged and half-starved during the first six months of his life and I feel sure there was an emotional need behind that question. Freud lays great stress on the part played in the girl's psychological development by her envy of her brother's genital organ. I am inclined to think that an equal, if not greater, effect is produced in a boy's psychology, when he discovers that he cannot be a mother.

The following is an account of the sex questions asked by an English girl brought up in India. She was the eldest child. At the age of two years and nine months she saw her mother knitting and asked her what she was making. Her mother told her she was making a coat for a new baby that was coming to live with them. The little girl Ann at once said, 'I got lots of coats', and went to her cupboard and proceeded to try on every coat that she could find regardless of the high temperature—100°F. Some days later she said suddenly 'When I am big I shall have a baby in my tummy'. When she was three years and three months old her mother had twin babies, both boys. At first Ann was delighted and showed no signs of jealousy. Two months later the twin babies were ill and her mother could pay Ann very little attention. Ann became very difficult and delighted in making scenes, and openly declared several times that she hated the babies and wished that they would go away or die. About the same time Ann came to her mother almost beside herself with rage and said, 'My ayah tells me that the babies came in a parcel from Granny and my ayah is wrong'. It took her mother some time to pacify her. It is very usual for children who have been told the truth to resent strongly any subsequent effort to mislead them. At the same age, three years and five months, Ann asked 'Did you mean to have two babies or was it a mistake?' One day her mother was showing her a little book about the visit of the shepherds to the manger. She listened enthralled until they came to the first picture of the Baby Jesus, then she said firmly, 'I don't think I like about little babies'. A month later when Ann was 3½ her grandparents came to stay at her home and made a great fuss of her and did not like the wailing, sickly twin babies so much. From the day they arrived Ann's behaviour began to improve and she began to enjoy the

twins again. At the age of four years she went to a wedding and asked why the bride and bridegroom were going to be married. Her mother replied because they loved each other and wanted to have a house of their own and perhaps after a time they would have a baby. Ann asked, 'Oh, will the baby be a bit like Aunt A and a bit like Uncle B?' When she was four years and four months old she asked 'Can babies just have mummies or must they have daddies too?' Her mother said that they must have fathers too and Ann asked why. Her mother explained that the speck of jelly inside the mother from which the baby grows does not begin to grow until a speck of jelly from the father is joined on to it. When Ann was five her cat had kittens, and she noticed that the cat was in discomfort the day the kittens arrived. The next day she asked her mother if the kittens hurt the cat when they were born, and if it had hurt her mother when she was born. Her mother replied 'It did hurt a bit for both of us but the part I remember best was being so pleased to see you'. Ann laughed and thought that was very funny. At the age of six years and eleven months Ann asked how and where the father's seed united with the mother's seed to make a baby. After her mother had explained that to her she asked if a baby began to grow every time the father's seed was put inside the mother. At the age of seven years and one month she told her mother that a little girl with whom she played thought that babies came down the chimney, and that this child's mother got 'kind of cross' when she asked her questions about them. Ann's mother asked if she told the other child what she knew about babies. Ann replied 'No, she seemed a bit funny and I don't think she really wanted to know'. She then asked 'What happens to children whose mothers don't tell them true things? Do they grow up not knowing?' Her mother said that sometimes other people told them or they read about things. Ann said 'I am glad you tell me things or else I might get in a muddle'.

The above description of children's questions has been given in detail to show you the kind of questions uninhibited children ask. If children are to be separated from their parents for the greater part of the day between the ages of two and seven, as they would be if they attended nursery schools, the nursery school teacher must be prepared to answer these questions truthfully and it is necessary for the children's best psychological development that they should so answer them. It is most important that the teacher should not be suffering from repressions or a distorted attitude towards sex. The nursery school provides an environment in which town children can learn something of the lives of plants and animals; gardening and the care of pets are essential activities of the nursery school. The care of animals will help children to satisfy sex curiosity

in a natural way especially if the teacher is not repressive and is prepared to help the child by allowing him to observe and ask questions freely. When sun-bathing, the children should be naked so that they may learn to recognize in a natural way the differences be-

tween the sexes. By such measures the nursery schools of the future will promote the healthy and normal development of the sex instinct, and so doing will lessen the burden of neurotic illness which has to be borne by the adult community.

## Medical News

### MASULIPATAM MEDICAL ASSOCIATION

THE Masulipatam Medical Association was revived on 26th September, 1937, at a meeting held in the dispensary of Dr. P. S. Chalapati Rao who entertained the members with tea. Dr. M. Seshacharyalu took the chair. The secretary of the association, Dr. Seshagiri Rao, read a report of the work of the association and the causes of its inactivity for the last one and a half years and next made a few suggestions for the future work of the association. He suggested that the monthly subscription be reduced from one rupee to eight annas, which amount would be sufficient, and that the monthly meetings be hereafter arranged by each one of the members in turn, the member to issue a joint invitation with the secretary.

Dr. S. Hanumantha Rao suggested that inasmuch as this association is primarily intended to safeguard the interests of the independent medical profession a clause be added in the rules preventing official members of the profession from being members on the executive of this association. The motion was opposed by Dr. A. Seshagiri Rao who said that such distinctions are not in the best interests of this association. It was finally resolved to keep the office-bearing positions also open for every one, independent or official.

Drs. M. Seshacharyalu and A. Seshagiri Rao who are secretaries of the recently-opened 'Aghobal Harijan Dispensary' (a poor dispensary) at Masulipatam referred to the burden on the shoulders of the members of the Masulipatam Medical Association in efficiently carrying out the honorary work in the charitable institution and requested all to give their willing support for the noble cause. The meeting terminated with a vote of thanks. Dr. P. V. Vyasa Rao invited the next meeting of the association to his dispensary.

### FIFTH COURSE OF POST-GRADUATE INSTRUCTION IN MALARIOLOGY, UNDER THE AUSPICES OF THE LEAGUE OF NATIONS, SINGAPORE

THE League of Nations is arranging for a fifth course of instruction in malariology which will commence at the King Edward VII College of Medicine at Singapore in April 1938.

The object of the course is to complete the training of medical practitioners who are engaged, or intend to be engaged, in the work of malaria control in their own countries. The course will thus be of interest not only to governments and municipal authorities, but also to all medical men practising in eastern countries, particularly those engaged in estate work.

The course will continue for a period of six to seven weeks and will be carried out partly at the King Edward VII College of Medicine and partly at the Tan Tock Seng Hospital, Singapore.

The practical malaria surveys will be arranged for outside Singapore at the end of the course in a suitable district in Malaya where the principal vectors are found and where their habits can be studied as well as the measures adopted to control their development.

*Conditions of admission.*—The course is open to medical practitioners, from whom applications for admission will be received up to the 26th February, 1938.

*Fee.*—The fee for the whole course or any part of it is seventy-five Straits dollars (\$75), payable in advance.

[The syllabus for 1938 has not yet been received, but we understand that it is on the same lines as last year, *vide* December 1936 issue, p. 730.]

### MALARIAL MOSQUITOES

#### DELHI CAMPAIGN SUCCESS

REMARKABLE results have been obtained as a result of the work of the anti-malaria staff in Delhi.

Rainfall being below normal, mosquito-breeding places are reported to have been easily controlled by temporary measures. The staff has been engaged upon the weeding and edging of excavations and the removal of grass from certain areas, exposing depressions which could then be promptly treated when necessary. A low-lying tract has been raised sufficiently to counteract swamp-formation, even when the river rises to a level higher than that observed in the preceding season.

Collections of adult mosquitoes throughout the Delhi urban area indicated a remarkably low prevalence of malaria-carrying mosquitoes.

A spleen census of school children taken in a group of schools, approximately on the same dates as last year, has shown a continued decline in the spleen rate.

The use of insecticidal spray for the control of malaria in certain isolated communities was continued. In addition, the villages of Jangpura and Nizamuddin were included in this year's spraying programme, and careful records are being maintained of the effects of these measures on the incidence of malaria.

A camp accommodating approximately 3,000 coolies has been established near the Purana Quila. Special attention was given to this area. Mosquito-breeding centres round the camp are being systematically controlled and prompt and efficient treatment is being made available for malaria cases.

### WATER PURIFICATION

#### ZOOLOGICAL SURVEY INVESTIGATION

INVESTIGATIONS by the Zoological Survey of the Government of India have solved a problem which was threatening to dislocate Calcutta's water supply.

The investigations were undertaken with the object of improving the conditions of filtration in the sand filter-beds of the waterworks, the clogging of which involves a loss of about Rs. 100 per day per filter-bed.

A very large number of living organisms and plants was found in the beds. It was discovered that the filter-beds were blocked by the secretions of the grub of a fly which infests the neighbourhood. These grubs in turn secrete a sticky substance with which they cement together sand particles into tubes or mounds.

The simple remedy was to clear the grass and vegetation near the beds, for this attracted the flies which were responsible for the grubs. This suggestion has been adopted by the authorities with good effect.

A comprehensive examination of the filter-beds, settling tanks, cisterns, etc., was made at the same time, a great deal of valuable information about different plants and insects being obtained regarding questions of water purification in India on a large scale.

## INDIAN STUDENTS IN U. K.

AN increase in the work connected with students is shown in the report for 1935-36 of the Education Department of the office of the High Commissioner for India in London.

The number of students on whose behalf offers of admission to educational institutions in the United Kingdom were obtained showed an increase over the previous academic year. The number of interviews was well over 5,000 as compared with under 3,000 in 1926-27.

Two hundred and six students were formally under the supervision of the department including 116 State and special scholars, 27 students in receipt of grants or allowances from private, memorial or trust funds, 40 Indian Civil Service and Forestry Service probationers, 8 students awarded grants-in-aid, and 16 private students entrusted to the care of the High Commissioner. There were 1,350 Indian students pursuing full-time courses at universities and colleges in the United Kingdom during the year under review, this being slightly above the number in the previous year.

The report remarks that the number of students taking courses in education, both theoretical and practical, was unusual, and that, having regard to the immensity and complexity of the problems of education which sooner or later would have to be faced and resolved in the new India, it might confidently be expected that these students would, in due course, play their part in contributing to the educational development of their country.

The report states:

'The department is frequently called upon to deal with cases of serious illness amongst students who might not have been allowed to leave India, if, as has been frequently and strongly recommended in successive reports, they had been given a strict medical examination before departure.

'Others arrive in England, not only without the qualifications necessary for admission to a degree or other course, but without guarantee for the regular provision of adequate funds, and, in not a few instances, without the moral stamina necessary to face new and strange conditions in a foreign country far from the influences of family and home.

'As a result, cases came frequently to the notice of the department of students, who, owing to extravagance or lack of sufficient and regular remittances, were either destitute or were earning a precarious living in menial employment of some kind or other. From time to time, the department was also called upon to rescue Indian youths who had fallen into evil ways or had become the dupes of undesirable associates.

'The problem is a grave one, not only because of the individual suffering and wastage, but because the good repute and standing of the Indian student community in this country was, in this way, unfairly prejudiced by the failures and shortcomings of a small minority of their compatriots'.

## INDIAN MEDICAL COUNCIL

COLONEL C. H. REINHOLD, M.C., nominated as a member of the Medical Council of India from the Punjab.

## Current Topics

## A New Remedy for Diabetic Ketosis

(From the *Lancet*, 24th July, 1937, Vol. II, p. 200)

PROFESSOR SZENT-GYÖRGYI's record as an investigator ensures immediate attention for his latest and most exciting observations. In brief, an idea springing from his studies of tissue metabolism led him to try the effect of succinic acid as a remedy for the ketosis of diabetes. Only five patients have so far been treated, but in one of these it was found that as little as 1.0 gramme daily by mouth would remove ketosis, the acetone bodies disappearing completely from the urine and the alkali reserve rising. In one of these cases the patient had suffered from diabetes for several years and had been kept free from ketonuria and glycosuria by a carefully controlled diet and 70 units of insulin daily. But even this treatment had failed in the long run, and just before her treatment with succinic acid her symptoms were severe, with a blood-sugar of 352 mg. per 100 c.cm., and an alkali reserve of 25 vols. per cent. Koranyi and Szent-Györgyi discontinued the insulin injections, and gave instead 10 g. of succinic acid per day orally. By the fourth day, though the concentration of sugar in the urine was unaltered, acetone bodies had disappeared from the urine, and later the alkali reserve was found to have risen sharply. That this remarkable result was not merely fortuitous was shown on two occasions by return of ketosis when use of the acid was stopped for a few days. Finally it proved possible to reduce the dose of succinic acid to 1.0 g. per day, and at the same time the urine could be kept sugar-free by the simultaneous administration of 10 units of insulin daily—in contrast to the 70 units previously given. Though this was the most striking of the five cases the others also yielded evidence of the antiketogenic effect of the acid. In announcing these results at an early stage Koranyi and Szent-Györgyi wish the possibilities of their method to be explored by others. From their brief experience they suggest that the treatment of a

new patient should begin with a daily dose of 10 g. of succinic acid, that this dosage should be maintained until 1 or 2 days after disappearance of the acetonuria, and that it should then be gradually reduced. The acid is given after meals as a 2 per cent solution in tap-water, the total dose being divided throughout the day. Unfortunately it is apt to produce severe nausea, and causes distress especially to patients with hyperacidity, so that experiments are now being made with its administration in capsules, or as the calcium salt in powder form.

Szent-Györgyi provides an explanation of these findings in terms of tissue metabolism. During the last few years he has developed a theory that the respiration of tissues is catalyzed by certain C<sub>4</sub>-dicarboxylic acids, of which succinic acid is one. He now claims that in particular the oxidation of pyruvic acid, an intermediary substance in the metabolism of carbohydrates, is catalyzed by these C<sub>4</sub> acids. He further states that if for any reason this catalysis fails, the pyruvic acid is not oxidized, but is instead converted into acetone bodies. (That such a conversion can occur has indeed been known for many years.) He therefore suggests that the ketosis of diabetes is due to failure of the C<sub>4</sub> acids to catalyze the oxidation of pyruvic acid, this failure probably being due to a shortage of C<sub>4</sub>-dicarboxylic acids in diabetes, either because their formation is inhibited or because their destruction is accelerated. Administration of small amounts of a C<sub>4</sub>-acid, such as succinic acid, might thus, it is argued, restore catalysis of the pyruvic acid oxidation and so stop the formation of acetone bodies. Whether this argument will prove acceptable cannot be decided before publication of the evidence on which it rests. From the clinical standpoint, however, it is clear that if others have the same experiences as Koranyi and Szent-Györgyi a substantial advance will have been made in improving the lot of the diabetic. Succinic acid is cheap, and the advantage of its being given by mouth needs no emphasis. If the dose of insulin can be

reduced when succinic acid is given at the same time, a great saving will be effected; and the use of one of the new combinations of insulin with a prolonged action might mean that the dosage could be kept at a very low level indeed.

### Nutritional Needs in Pregnancy\*

By SIR ROBERT MCCARRISON, LL.D., M.D., F.R.C.P.  
MAJOR-GENERAL, I.M.S. (Retd.)

(From the *British Medical Journal*, 7th August, 1937,  
Vol. II, p. 256)

LAST year at the inaugural meeting of the Section of Nutrition in Oxford, I ventured to predict that the day was not far distant when, instead of one morning being devoted to its work, it would rank with the Section of Medicine as a three-day fixture. To-day my prediction is two-thirds of the way towards fulfilment. And it is perhaps fitting that the Section of Obstetrics and Gynaecology should be the first to ally itself with that of Nutrition. By this alliance and by the application of the principles of nutrition to the mothers of our race and to their children we begin at the beginning to lay the foundations of a more healthful existence for our people—a finer structure of national health. For, as Carrell has recently reminded us, 'nutrition is synonymous with existence'; synonymous, that is to say, with the act of living, with the exercise of the vital functions. To this I would add that faulty nutrition is synonymous with faulty existence, with the faulty exercise of the vital functions.

For the student of nutrition there is no more enlightening experience than to observe the behaviour of cells under cultural conditions *in vitro*. Soon he perceives that their growth, their reproduction, their structure, and their functions depend not only on the composition of the fluid medium in which they are immersed but on the removal from it of the waste products of their activities. So it is with the human body; that vast aggregation of cells, living, moving, and having their being within the closed circuit of the blood stream. For them the continual purification of the fluid medium in which they live is as necessary to their well-being as its continual enrichment with essential nutrients. It is to these two ends that the processes involved in the function of nutrition are directed and co-ordinated. Inspiration, mastication, deglutition, digestion, absorption, and circulation; these are the supply services. Exhalation, perspiration, urinary excretion, and defecation: these are the sanitary services. The central act—assimilation—in the series of processes involved in nutrition is a function of living matter, dependent on the efficiency of the supply services on the one hand and on that of the sanitary services on the other. To the cell belongs the task of nourishing itself; to us, as physicians, belongs the task of enabling it to do so by our supervision of the efficiency of these two services.

Nutrition, then, is the sum of the acts or processes by which the structure and functions of all organs and parts of the body—including, of course, those that subserve the function of reproduction—are established and maintained. It is, in short, that function of the body by which health is maintained: health, which implies the ability to produce and rear offspring fitted to live and efficiently to perform the functions of their species.

#### CONTINUED EFFICIENCY OF THE FUNCTION OF NUTRITION

It is customary to speak of nutrition in pregnancy as though it differed in some directions—in the supply of certain food essentials, for instance—from nutrition of other periods of life. Indeed, the very title of our subject suggests such a distinction. It is customary also to speak of pregnancy as though it involved an additional burden on the maternal organism, as, unfortunately, it often does. But I suggest to you that the

nutritional needs in pregnancy are those necessary to the continued efficiency of the function of nutrition throughout life. For in this efficiency the efficiency of that other fundamental function of the body—reproduction—is inherent. As well might we regard the taking of a steep hill as a feat additional to the normal function of a motor car as regard the making of a seven-pound baby as a feat additional to the normal function of woman. The properly constructed car, the properly adjusted, oiled, greased, fuelled, and tended car takes the hill in its stride; the properly constructed, adjusted, fuelled, and tended woman takes pregnancy in hers. It is this construction, this adjusting, this fuelling, this tending, that, in the perfection of its operation, the function of nutrition effects. But the case is different with the ill-constructed, the ill-adjusted, the ill-tended woman, in whom the function of nutrition from infancy onwards has been faulty. Then, indeed, pregnancy becomes a feat to which some succumb and from which many emerge with some weakness exposed, some permanent damage incurred. It is not, however, with the ill-constructed, the ill-adjusted, the ill-nourished, the ill-conditioned that I am here concerned, but with the Rolls-Royce of womanhood, or for that matter with the dependable Baby Austin or Morris Minor. It is to the production of these—aye, to their mass-production—that we must direct our energies, though the salvaging, the patching-up, of wrecks must still remain our portion.

The nutritional needs in pregnancy are, I repeat, those necessary to the efficiency of the function of nutrition. Their satisfaction must begin not with conception but with the antenatal life of the mothers of our race. It must continue throughout the period of their growth and development up to, during, and following the period when they find their fulfilment in motherhood: a fulfilment for which nutrition prepares and makes ready the way—sometimes well, sometimes ill, according to its perfection or imperfection. It is impossible to dissociate reproduction from nutrition. It is impossible to dissociate reproduction from the acts and processes involved in nutrition. Respiration, digestion, absorption, secretion, circulation, assimilation, excretion: these are prologues to the crowning act of the imperial theme of motherhood.

#### FOUR THINGS NEEDFUL

What, then, are the things needful to the efficiency of the function of nutrition? They are:

*First*, the adequate provision of the materials with which this function is effected: oxygen, water, properly constituted food, and a substance or substances produced in the skin by the action of sunlight.

*Second*, the efficient performance of each one of the acts or processes involved in nutrition, these acts or processes being themselves dependent on the proper nourishment of the organs and tissues performing them.

*Third*, the practice of measures and habits of life favourable to the efficiency of the function of nutrition: appropriate exercise in the open air, proper breathing, agreeable mental occupation, promotion of the function of the skin by bathing, suitable clothing, and exposure of parts of the body to such sunlight as is available, promotion of the action of the kidneys and bowels by proper food and the free consumption of water.

*Fourth*, the avoidance of all influences that adversely affect the function of nutrition: such, for instance, as insufficient rest and want of sleep, bad ventilation, insanitary conditions generally, worry, emotional excitement, constipation, alcohol, and infection.

These are the nutritional needs in pregnancy as they are the nutritional needs of the body throughout life. Their satisfaction makes of pregnancy one of the happiest, the most healthful, periods of a woman's life.

#### DIETETIC REQUIREMENTS IN PREGNANCY

This brings me to that section of our subject which, to judge by the programme before us, is to occupy the remainder of this morning's session: dietetic requirements in pregnancy. I shall not attempt to discuss these requirements in detail, but will content myself with an enumeration of the foodstuffs which, if properly

\* Read in opening a discussion at a joint meeting of the Sections of Nutrition and Obstetrics and Gynaecology at the Annual Meeting of the British Medical Association, Belfast, 1937.

produced, properly treated, and properly combined, provide all the food essentials the prospective mother needs. These foodstuffs are, in order of precedence: (1) Milk and the products of milk (butter, cheese, skimmed milk, buttermilk). (2) Whole or lightly milled cereal grains; in particular a good wholemeal bread or standard bread, and oatmeal. (3) Green and leafy vegetables. (4) Root vegetables, particularly potatoes, carrots, and onions. (5) Fruit, including the tomato. (6) Pulses. (7) Egg. (8) Meat, including fish, fowl, and glandular organs. To these there must in this country be added cod-liver oil, not in the large doses commonly prescribed but in the sufficient dose of a teaspoonful daily. And as an additional assurance of functional efficiency of blood, muscle, and nerve, a portion of yeast extract is a wise precaution.

Those of you who have studied the revised report of the Technical Commission appointed by the League of Nations to define the nutritional needs of the human being in the course of development from conception to adult age will be aware that it is from these foodstuffs that the Commission prepared their dietary schedules for all periods of life up to and including pregnancy. They had in mind, no doubt, the preparation of the female of the human species for motherhood.

#### ANIMAL PROTEIN: WHOLEMEAL BREAD

One revision of this report has been made, and I hope that the next one, already foreshadowed, will remove what, in my opinion, are three blemishes on its excellence. The first of these is the unnecessarily high amount of animal protein (68 grammes out of a total protein content of 105 grammes) it prescribes. The 40 grammes provided by milk and cheese are sufficient—though an additional 10 grammes may be provided by liver, fish, or meat—sufficient, that is to say, if whole cereal or lightly milled cereals be used instead of highly milled ones and if more green-leaf vegetables be included in the diet. Physiological as well as economic prudence forbids a greater intake of animal protein than is needful.

My second criticism is the insufficient insistence on the use of wholemeal bread. 'White flour in the process of milling is deprived of important nutritive elements. Its use should be decreased and partial substitution by lightly milled cereals, and especially potatoes, is recommended'. The exhortation is well enough so far as it goes. But it is complete, not partial, substitution that must, in my view, be at all times and in all places insisted upon. For the important nutritive elements of which white flour is deprived include the vitamin-B complex, vitamin E, an unidentified hæmopoietic factor, the proteins of the germ and bran which are of relatively high nutritive value and so constituted as to supplement those of the interior of the grain, and fibre, which is of particular merit in ensuring the efficient action of the bowels. It is folly to deprive bread—the staff of life—of nutritive elements so important to the well-being of the body, whether in pregnancy or at other periods of life.

#### FRESH VEGETABLES AND FRUIT

The third criticism that I have to offer is the relative paucity of fresh green vegetables and raw ripe fruit in the dietary schedule. These should form a large part of the daily diet. It is not alone for their vitamin-C content that they are of such value, but for their proteins which, though small in amount, are of high biological value, for their mineral contents, and for their utility in maintaining the balance between alkali-yielding and acid-yielding ingredients of the food.

### The Transfusion of Stored Cadaver Blood

By PROFESSOR W. N. SHAMOV

(From the *Lancet*, 7th August, 1937, Vol. II, p. 306)

It is well known that the death of an animal by no means involves a simultaneous death of all its tissues and organs. For instance, the muscles removed from the body of a recently killed animal remain contractile

for several hours; other examples include the heart, the blood-vessels, and the endocrine glands. Death, therefore, is only the moment of destruction of an intricate complex of connections and mutual relations between the separate tissues of an organism, which retain their full vitality and function for a varying time. The time depends chiefly on how far the artificial conditions are able to satisfy their fundamental requirements of nutrition and the removal of the products of metabolism. The most elementary of these conditions are shown by tissue cultures, which may grow *in vitro* for an unlimited time so long as they are periodically washed and transplanted on new nutritive media. But the vitality of such organs as the heart requires for its support a very much more complicated environment which it is difficult to create artificially, and they can exist *in vitro* for only a comparatively short time. The ideal conditions, of course, would be found only in another living organism where all the processes of nutrition and metabolism are accurately regulated. A good example of this is given by blood transfusion, where the blood of one animal after long preservation *in vitro* can be successfully transfused into another, and continue to accomplish all its fundamental functions.

From this an extremely interesting question arises: Could not some tissues or organs from the dead body be transferred to the living and continue to function normally? Can a defect in a living body be remedied by the transplantation of tissue from the dead, already doomed soon to perish? The solution of this problem would not only be of the greatest biological interest but might also disclose wide prospects for practical surgery.

#### PRELIMINARY EXPERIMENTS

As the object of my first researches in this direction I selected the blood, since more is known about the method of its transference, and all the destructive processes that develop after death have a greater influence on it than is the case in any other tissue. Against this there is the weighty objection that an abundant bacterial flora may enter the blood stream even during the last agony, and that, moreover, it must contain a great quantity of toxic substances as the result of death and the autolysis of tissues. But these *a priori* objections, though logical, need scientific support, and I therefore arranged three series of experiments. I must own that on approaching our researches I thought it hardly probable that the blood from a dead body could be introduced with impunity into the blood system of a living animal. Our notions of death suggested a whole series of acutely toxic substances entering the blood, which must be fatal to any living organism.

The first series of investigation, conducted under my direction by Dr. Kostjukov in 1927, consisted of systematic bacteriological examinations of different tissues and organs taken from animals at varying intervals after their death, and with varying conditions of storing and dead bodies.

In all, 402 examinations were made of tissues and organs taken from the cadavers of 47 animals, killed in different ways and kept at a temperature of 4° to 22.5°C. at a time ranging from 15 minutes to 12 days after the death of the animal.

These investigations have shown us that the development of infection in any tissue of the dead body depends upon two factors. The first is the nearness of the given tissues or organs to the chief focus of infection—in healthy animals the gastro-intestinal tract, whence it spreads rapidly by the portal system to the abdominal organs; the farther from the gut the organ the later it is infected. If there are other foci, infection from these will also proceed parallel with that from the intestine. The second factor is the temperature at which the cadaver is kept. In the most favourable conditions for preservation—about freezing point—the tissues nearest to the focus of infection begin to be infected after 10 days. We found this in the peritoneal exudate, the peritoneum itself, and the liver, while the sterility of the tissues further away from the abdominal cavity—brain, muscles, joints, marrow, and heart blood—is preserved for 12 days and more. Even under less



reduced when succinic acid is given at the same time, a great saving will be effected; and the use of one of the new combinations of insulin with a prolonged action might mean that the dosage could be kept at a very low level indeed.

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For the student of nutrition there is no more enlightening experience than to observe the behaviour of cells under cultural conditions *in vitro*. Soon he perceives that their growth, their reproduction, their structure, and their functions depend not only on the composition of the fluid medium in which they are immersed but on the removal from it of the waste products of their activities. So it is with the human body; that vast aggregation of cells, living, moving, and having their being within the closed circuit of the blood stream. For them the continual purification of the fluid medium in which they live is as necessary to their well-being as its continual enrichment with essential nutrients. It is to these two ends that the processes involved in the function of nutrition are directed and co-ordinated. Inspiration, mastication, deglutition, digestion, absorption, and circulation; these are the supply services. Exhalation, perspiration, urinary excretion, and defaecation: these are the sanitary services. The central act—assimilation—in the series of processes involved in nutrition is a function of living matter, dependent on the efficiency of the supply services on the one hand and on that of the sanitary services on the other. To the cell belongs the task of nourishing itself; to us, as physicians, belongs the task of enabling it to do so by our supervision of the efficiency of these two services.

Nutrition, then, is the sum of the acts or processes by which the structure and functions of all organs and parts of the body—including, of course, those that subserve the function of reproduction—are established and maintained. It is, in short, that function of the body by which health is maintained: health, which implies the ability to produce and rear offspring fitted to live and efficiently to perform the functions of their species.

#### CONTINUED EFFICIENCY OF THE FUNCTION OF NUTRITION

It is customary to speak of nutrition in pregnancy as though it differed in some directions—in the supply of certain food essentials, for instance—from nutrition of other periods of life. Indeed, the very title of our subject suggests such a distinction. It is customary also to speak of pregnancy as though it involved an additional burden on the maternal organism, as, unfortunately, it often does. But I suggest to you that the

nutritional needs in pregnancy are those necessary; the continued efficiency of the function of nutrition throughout life. For in this efficiency the efficiency of other fundamental function of the body—reproduction—is inherent. As well might we regard the taking steep hill as a feat additional to the normal function of a motor car as regard the making of a seven-penny baby as a feat additional to the normal function of a woman. The properly constructed car, the properly adjusted, oiled, greased, fuelled, and tended car takes the hill in its stride; the properly constructed, adjusted, fuelled, and tended woman takes pregnancy in its stride. It is this construction, this adjusting, this fuelling, this tending, that, in the perfection of its operation, is the function of nutrition effects. But the case is different with the ill-constructed, the ill-adjusted, the ill-tended woman, in whom the function of nutrition from infancy onwards has been faulty. Then, indeed, pregnancy becomes a feat to which some succumb and from whom many emerge with some weakness exposed, some permanent damage incurred. It is not, however, with the ill-constructed, the ill-adjusted, the ill-nourished, the ill-conditioned that I am here concerned, but with the Rolls-Royce of womanhood, or for that matter with the dependable Baby Austin or Morris Minor. It is to the production of these—aye, to their mass-production—that we must direct our energies, though the salvage of the patching-up, of wrecks must still remain our por-

The nutritional needs in pregnancy are, I repeat, necessary to the efficiency of the function of nutrition. Their satisfaction must begin not with conception but with the antenatal life of the mothers of our race must continue throughout the period of their growth and development up to, during, and following the period when they find their fulfilment in motherhood: a fulfilment for which nutrition prepares and makes ready way—sometimes well, sometimes ill, according to the perfection or imperfection. It is impossible to dissociate reproduction from nutrition. It is impossible to dissociate reproduction from the acts and processes involved in nutrition. Respiration, digestion, absorption, secretion, circulation, assimilation, excretion: these are prologues to the crowning act of the imperial throne of motherhood.

#### FOUR THINGS NEEDFUL

What, then, are the things needful to the efficiency of the function of nutrition? They are:

*First*, the adequate provision of the materials by which this function is effected: oxygen, water, properly constituted food, and a substance or substances produced in the skin by the action of sunlight.

*Second*, the efficient performance of each one of the acts or processes involved in nutrition, these acts or processes being themselves dependent on the proper nourishment of the organs and tissues performing them.

*Third*, the practice of measures and habits of life favourable to the efficiency of the function of nutrition: appropriate exercise in the open air, proper breathing, agreeable mental occupation, promotion of the function of the skin by bathing, suitable clothing, and exposure of parts of the body to such sunlight as is available; promotion of the action of the kidneys and bowels by proper food and the free consumption of water.

*Fourth*, the avoidance of all influences that are likely to affect the function of nutrition: such, for instance, as insufficient rest and want of sleep, bad ventilation, insanitary conditions generally, worry, emotional excitement, constipation, alcohol, and infection.

These are the nutritional needs in pregnancy as they are the nutritional needs of the body throughout life. Their satisfaction makes of pregnancy one of the happiest, the most healthful, periods of a woman's life.

#### DIETETIC REQUIREMENTS IN PREGNANCY

This brings me to that section of our subject which I judge by the programme before us, is to occupy the remainder of this morning's session: dietetic requirements in pregnancy. I shall not attempt to discuss these requirements in detail, but will content myself with an enumeration of the foodstuffs which, if properly

\* Read in opening a discussion at a joint meeting of the Sections of Nutrition and Obstetrics and Gynaecology at the Annual Meeting of the British Medical Association, Belfast, 1937.



produced, properly treated, and properly combined, provide all the food essentials the prospective mother needs. These foodstuffs are, in order of precedence: (1) Milk and the products of milk (butter, cheese, skimmed milk, buttermilk). (2) Whole or lightly milled cereal grains; in particular a good wholemeal bread or standard bread, and oatmeal. (3) Green and leafy vegetables. (4) Root vegetables, particularly potatoes, carrots, and onions. (5) Fruit, including the tomato. (6) Pulses. (7) Egg. (8) Meat, including fish, fowl, and glandular organs. To these there must in this country be added cod-liver oil, not in the large doses commonly prescribed but in the sufficient dose of a teaspoonful daily. And as an additional assurance of functional efficiency of blood, muscle, and nerve, a portion of yeast extract is a wise precaution.

Those of you who have studied the revised report of the Technical Commission appointed by the League of Nations to define the nutritional needs of the human being in the course of development from conception to adult age will be aware that it is from these foodstuffs that the Commission prepared their dietary schedules for all periods of life up to and including pregnancy. They had in mind, no doubt, the preparation of the female of the human species for motherhood.

#### ANIMAL PROTEIN: WHOLEMEAL BREAD

One revision of this report has been made, and I hope that the next one, already foreshadowed, will remove what, in my opinion, are three blemishes on its excellence. The first of these is the unnecessarily high amount of animal protein (68 grammes out of a total protein content of 105 grammes) it prescribes. The 40 grammes provided by milk and cheese are sufficient—though an additional 10 grammes may be provided by liver, fish, or meat—sufficient, that is to say, if whole cereal or lightly milled cereals be used instead of highly milled ones and if more green-leaf vegetables be included in the diet. Physiological as well as economic prudence forbids a greater intake of animal protein than is needful.

My second criticism is the insufficient insistence on the use of wholemeal bread. 'White flour in the process of milling is deprived of important nutritive elements. Its use should be decreased and partial substitution by lightly milled cereals, and especially potatoes, is recommended'. The exhortation is well enough so far as it goes. But it is complete, not partial, substitution that must, in my view, be at all times and in all places insisted upon. For the important nutritive elements of which white flour is deprived include the vitamin-B complex, vitamin E, an unidentified hæmopoietic factor, the proteins of the germ and bran which are of relatively high nutritive value and so constituted as to supplement those of the interior of the grain, and fibre, which is of particular merit in ensuring the efficient action of the bowels. It is folly to deprive bread—the staff of life—of nutritive elements so important to the well-being of the body, whether in pregnancy or at other periods of life.

#### RAW MEATS, PULSES AND FRUIT

The third criticism I have to offer is the relative paucity of fresh green vegetables and raw ripe fruit in the dietary schedule. These should form a large part of the daily diet. It is not alone for their vitamin-C content that they are of such value, but for their proteins which, though small in amount, are of high biological value, for their mineral contents, and for their utility in maintaining the balance between alkali-yielding and acid-yielding ingredients of the food.

### The Transfusion of Stored Cadaver Blood

By PROFESSOR W. N. SHAMOV

(From the *Lancet*, 7th August, 1937, Vol. II, p. 306)

It is well known that the death of an animal by no means involves a simultaneous death of all its tissues and organs. For instance, the muscles removed from the body of a recently killed animal remain contractile

for several hours; other examples include the heart, the blood-vessels, and the endocrine glands. Death, therefore, is only the moment of destruction of an intricate complex of connections and mutual relations between the separate tissues of an organism, which retain their full vitality and function for a varying time. The time depends chiefly on how far the artificial conditions are able to satisfy their fundamental requirements of nutrition and the removal of the products of metabolism. The most elementary of these conditions are shown by tissue cultures, which may grow *in vitro* for an unlimited time so long as they are periodically washed and transplanted on new nutritive media. But the vitality of such organs as the heart requires for its support a very much more complicated environment which it is difficult to create artificially, and they can exist *in vitro* for only a comparatively short time. The ideal conditions, of course, would be found only in another living organism where all the processes of nutrition and metabolism are accurately regulated. A good example of this is given by blood transfusion, where the blood of one animal after long preservation *in vitro* can be successfully transfused into another, and continue to accomplish all its fundamental functions.

From this an extremely interesting question arises: Could not some tissues or organs from the dead body be transferred to the living and continue to function normally? Can a defect in a living body be remedied by the transplantation of tissue from the dead, already doomed soon to perish? The solution of this problem would not only be of the greatest biological interest but might also disclose wide prospects for practical surgery.

#### PRELIMINARY EXPERIMENTS

As the object of my first researches in this direction I selected the blood, since more is known about the method of its transference, and all the destructive processes that develop after death have a greater influence on it than is the case in any other tissue. Against this there is the weighty objection that an abundant bacterial flora may enter the blood stream even during the last agony, and that, moreover, it must contain a great quantity of toxic substances as the result of death and the autolysis of tissues. But these *a priori* objections, though logical, need scientific support, and I therefore arranged three series of experiments. I must own that on approaching our researches I thought it hardly probable that the blood from a dead body could be introduced with impunity into the blood system of a living animal. Our notions of death suggested a whole series of acutely toxic substances entering the blood, which must be fatal to any living organism.

The first series of investigation, conducted under my direction by Dr. Kostjukov in 1927, consisted of systematic bacteriological examinations of different tissues and organs taken from animals at varying intervals after their death, and with varying conditions of storing and dead bodies.

In all, 402 examinations were made of tissues and organs taken from the cadavers of 47 animals, killed in different ways and kept at a temperature of 4° to 22.5°C. at a time ranging from 15 minutes to 12 days after the death of the animal.

These investigations have shown us that the development of infection in any tissue of the dead body depends upon two factors. The first is the nearness of the given tissues or organs to the chief focus of infection—in healthy animals the gastro-intestinal tract, whence it spreads rapidly by the portal system to the abdominal organs; the farther from the gut the organ the later it is infected. If there are other foci, infection from these will also proceed parallel with that from the intestine. The second factor is the temperature at which the cadaver is kept. In the most favourable conditions for preservation—about freezing point—the tissues nearest to the focus of infection begin to be infected after 10 days. We found this in the peritoneal exudate, the peritoneum itself, and the liver, while the sterility of the tissues further away from the abdominal cavity—brain, muscles, joints, marrow, and heart blood—is preserved for 12 days and more. Even under 1c

# THE INDIAN MEDICAL GAZETTE

reduced when succinic acid is given at the same time, a great saving will be effected; and the use of one of the new combinations of insulin with a prolonged action might mean that the dosage could be kept at a very low level indeed.

## Nutritional Needs in Pregnancy\*

By SIR ROBERT MCCARRISON, LL.D., M.D., F.R.C.P.  
MAJOR-GENERAL, I.M.S. (Retd.)  
(From the *British Medical Journal*, 7th August, 1937,  
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For the student of nutrition there is no more enlightening experience than to observe the behaviour of cells under cultural conditions *in vitro*. Soon he perceives that their functions depend not only on the structure, and their fluid medium in which they are immersed but on the removal of the waste products of their activities. So it is with the human body; that vast aggregation of cells, living, moving, and having their being within the closed circuit of the blood stream. For them the continual purification of the fluid medium in which they live is as necessary to their well-being as its continual enrichment with essential nutrients. It is to these two ends that the processes involved in the function of nutrition are directed and co-ordinated. Inspiration, mastication, deglutition, digestion, absorption, and circulation; these are the supply services. Exhalation, perspiration, urinary excretion, and defaecation: these are the sanitary services. The central act—assimilation—in the series of processes involved in the efficiency of the supply services, dependent on the efficiency of the sanitary services on the one hand and on that of the task of nourishing itself; to us, as physicians, belongs the task of enabling it to do so by our supervision of the efficiency of these two services.

Nutrition, then, is the sum of the acts or processes by which the structure and functions of all organs and parts of the body—including, of course, those that subserve the function of reproduction—are established and maintained. It is, in short, that function of the body by which health is maintained: health, which implies the ability to produce and rear offspring fitted to live and efficiently to perform the functions of their species.

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nutritional needs in pregnancy are those necessary to the continued efficiency of the function of nutrition throughout life. For in this efficiency the efficiency of that other fundamental function of the body—reproduction—is inherent. As well might we regard the taking of a steep hill as a feat additional to the normal function of a motor car as regard the making of a seven-pound baby as a feat additional to the normal function of a woman. The properly constructed car, the properly adjusted, oiled, greased, fuelled, and tended car takes the hill in its stride; the properly constructed, adjusted, fuelled, and tended woman takes pregnancy in hers. It is this construction, this adjusting, this fuelling, this tending, that, in the perfection of its operation, the function of nutrition effects. But the case is different with the ill-constructed, the ill-adjusted, the ill-fuelled, the ill-tended, the ill-perfected car. Then, indeed, pregnancy becomes a feat to which some succumb and from which many emerge with some weakness exposed, some permanent damage incurred. It is not, however, with the ill-constructed, the ill-adjusted, the ill-nourished, the ill-conditioned that I am here concerned, but with the Rolls-Royce of womanhood, or for that matter with the dependable Baby Austin or Morris Minor. It is to the production of these—aye, to their mass-production—that we must direct our energies, though the salvaging of the patching-up, of wrecks must still remain our portion.

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From this an extremely interesting question arises: Could not some tissues or organs from the dead body be transferred to the living and continue to function normally? Can a defect in a living body be remedied by the transplantation of tissue from the dead, already doomed soon to perish? The solution of this problem would not only be of the greatest biological interest but might also disclose wide prospects for practical surgery.

#### PRELIMINARY EXPERIMENTS

As the object of my first researches in this direction I selected the blood, since more is known about the method of its transference, and all the destructive processes that develop after death have a greater influence on it than is the case in any other tissue. Against this there is the weighty objection that an abundant bacterial flora may enter the blood stream even during the last agony, and that, moreover, it must contain a great quantity of toxic substances as the result of death and the autolysis of tissues. But these *a priori* objections, though logical, need scientific support, and I therefore arranged three series of experiments. I must own that on approaching our researches I thought it hardly probable that the blood from a dead body could be introduced with impunity into the blood system of a living animal. Our notions of death suggested a whole series of acutely toxic substances entering the blood, which must be fatal to any living organism.

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These investigations have shown us that the development of infection in any tissue of the dead body depends upon two factors. The first is the nearness of the given tissues or organs to the chief focus of infection—in healthy animals the gastro-intestinal tract, whence it spreads rapidly by the portal system to the abdominal organs; the farther from the gut the organ the later it is infected. If there are other foci, infection from these will also proceed parallel with that from the intestine. The second factor is the temperature at which the cadaver is kept. In the most favourable conditions for preservation—about freezing point—the tissues nearest to the focus of infection begin to be infected after 10 days. We found this in the peritoneal exudate, the peritoneum itself, and the liver, while the sterility of the tissues further away from the abdominal cavity—brain, muscles, joints, marrow, and heart blood—is preserved for 12 days and more. Even under less

favourable conditions these latter remain sterile at 14°C. for 60 hours, while after 24 hours at 22°C. only the bones and marrow are sterile.

Consequently, we can conclude that, contrary to all supposition, the development of infection in certain organs of the dead body takes place rather late—at an appropriate temperature approximately 10 days after death—and therefore surgeons may boldly make use of material from a dead body not only some hours but even some days after death.

The second series of experiments, to determine the toxicity of blood from a dead body, Dr. Kostiukov and I carried out in 1929. Appropriate experiments were made on 15 dogs with which 10 experiments were made, with different modifications.

The technique of the experiments was generally as follows:—

A dog was killed after measuring its weight, the blood volume, and the hæmoglobin and number of erythrocytes. Then its cadaver was kept for a certain time at a temperature varying from 5° to 25°C. in different cases. At first the animals were killed with chloroform. It was possible, however, that the amount of chloroform in the blood might influence the results, so we decided to kill the animal by strangling it with the noose of a rope, death taking place almost instantly. After a period of 3 to 11 hours the body was taken into the operating-room, and under aseptic conditions paraffined glass cannulæ were introduced into the central parts of the carotid and the internal jugular. By rubber tubes connected with the cannulæ it was possible either to draw blood from the vessels of the cadaver or to inject solutions into them. The blood when collected was mixed with a solution of sodium citrate to avoid coagulation.

In the first experiments, when the animal was killed by chloroform and the cadaver was kept in a warm place (22°C.), it was only during the first 4 hours after death that it was possible to get enough blood. After this there was so much clotting that liquid blood could only be obtained with great difficulty after squeezing out each clot. Five hours after death it was impossible to collect blood from the vessels at all. When later we proceeded to killing the animals by strangling, the blood was the typical dark fluid of asphyxia, and thrombosis did not take place in it for over 10 hours, especially when the cadaver was kept in a cool place.

When the blood had been thus obtained a live dog was brought into the operating-room whose blood volume, hæmoglobin content, and red cell count had been determined. After exposing the deep vessels in the neck paraffined cannulæ were introduced into its carotid and the internal jugular. Through the first, blood was drained from the animal and collected in a graduated cylinder; through the second, as soon as necessary, there was injected a salt solution or blood taken from the dead body.

In our first experiments we made very careful and comparatively small transfusions (200 to 300 c.cm.) from the cadaver into the live dog, which had already been subjected to a moderate bleeding, not exceeding 25 per cent of its total quantity of blood. The animals seemed so well after transfusion, however, and there was such an entire absence of toxic symptoms, that we soon proceeded to more copious bleedings and to increasing the dose of the transfusion.

Thus we convinced ourselves that even when we substituted blood from the cadavers for as much as 60 per cent of the total volume the animals stood the operation well without showing any sign of poisoning. It must first be mentioned that in these experiments we did not keep the cadaver in a cool place deliberately, but left it at a temperature of 17.5°C., and even 22.5°C.; and secondly, the blood was removed after the maximum time possible for such temperatures—i.e., after 4 to 5 hours, when clotting had already begun—so that before the transfusion we had to filter off a large number of clots.

From these experiments, therefore, we could conclude that even when keeping the cadaver at the most unfavourable temperatures, and for the longest possible

time, the blood possesses no great toxicity and may be transfused with impunity, even in large quantities, into living animals.

#### VITALITY OF CADAVER BLOOD

It was now possible to attempt to answer the next question, whether the erythrocytes could live and function after their transplantation into a living animal. The observations in the preceding experiments already seem to give an affirmative answer to this question, since in these animals there was neither the jaundice nor the hæmaturia that usually accompanies blood destruction, and their general condition was not that to be expected after the extensive bleeding that had been performed. It might be objected, however, that the blood from a dead body was simply a liquid of complex composition, which after transfusion acted purely mechanically by restoring the volume.

It might also be objected that the erythrocytes of the cadaver blood were already degenerating and were thus unable to perform their functions. To settle the question, and to remove all these objections, we arranged a third series of experiments, involving a much greater loss of blood. There were 20 experiments on 35 dogs, using the same technique as that in the second series. We knew already that dogs usually die when 60 to 70 per cent of the total blood volume is withdrawn. An injection of salt solution may temporarily restore the activity of the heart or of respiration, but it cannot ultimately save the animal. Our own experiments confirmed this. After removing 70 per cent of the animal's blood, and after the immediate injection of a corresponding quantity of warmed saline, not one survived.

Starting from these control figures we tried in our experiments to get the greatest possible exhaustion of blood. Since it usually ceases to flow from the carotid after 70 per cent has been withdrawn, we had to have recourse to repeated washing out of the animal's blood-vessels with warmed saline, temporarily reviving the animal. By this means we succeeded in raising the degree of blood exhaustion to 90 per cent. This is normally absolutely incompatible with life and no injections of saline or colloidal solutions can avail; only the transfusion of living, functioning blood can keep the animal alive. And yet we also succeeded in maintaining life by transfusing blood from a dead animal.

The following is an example:—

The dog had a total blood volume of 539 c.cm. with hæmoglobin 95 per cent and red cells 6,000,000. The first bleeding removed 70 per cent of the blood, which then ceased to flow from the carotid; the heart and respiration ceased. It was revived by injecting 160 c.cm. of saline. A second bleeding from the carotid produced diluted blood containing only 29 per cent hæmoglobin. Again 200 c.cm. of saline were injected and after bleeding the fluid contained only 7 per cent of hæmoglobin. The total quantity of the blood withdrawn reached 90 per cent. This was again followed by stopping the heart and respiration. After transfusion of 450 c.cm. of blood from the dead body, taken 8 hours after death, the animal <sup>the</sup> revived. On the next day the condition of the dog was good, the hæmoglobin being 75 per cent, the red cells 5,700,000. The dog lived in healthy condition for several weeks and then was used for another experiment.

In other experiments a similar effect was obtained by us from the transfusion of cadaver blood taken 10 and even 11 hours after the death of the animal.

These experiments leave no doubt about the fact that the erythrocytes of a dead body 10 and even 11 hours after death still retain their full vitality and are able to function physiologically quite as well as the erythrocytes of normal blood.

These facts were afterwards fully confirmed by the experiments of Barenboim and Skundina in 1931-32. They repeated our experiments, with various modifications, and then studied the vitality of transfused blood in dogs, using as a criterion the capability of the blood for gas exchange, which they established by Barcroft's method. Summing up the results of their experiments



upon 47 dogs, they arrive at the conclusion that for 6 and even 10 hours after death blood fully preserves its ability to fix oxygen and retains the properties of blood from the living.

To complete the picture one of my collaborators, Dr. G. G. Karavanov, in 1935 studied another of the elements of blood—the leucocytes—using their power of phagocytosis as a criterion of their vitality. Studying this systematically during the life of the animal, and at different times after its death, he established that phagocytosis is pretty well preserved for the first 11 hours after death, after which it disappears rapidly. These data therefore are also in accordance with the facts mentioned before and confirm our fundamental thesis that the blood in a dead body preserves its vitality for about 10 hours after death, and within this period may be used for transfusion into a live organism. The experimental part of the problem of transfusing cadaver blood may therefore be regarded as decided in principle.

#### CLINICAL TRIAL

The question now arises about the transference of this data to the transfusion of blood in man. Unfortunately a series of circumstances to do with organization prevented me from working out this part of the problem myself, and I am indebted to Professor S. S. Yudin who has continued the work that I began and has introduced into clinical practice the transfusion of blood from cadavers. The abundant material collected by him and his colleagues in the years 1932 to 1935 already includes statistical data for about 1,000 cases, and fully confirms all the fundamental principles that I have established.

It was only last year that it became possible for me to use cadaver blood in my own clinical practice, and our experience in 42 cases allows me to subscribe fully to the enthusiastic support given to this method by Professor Yudin. I must own that at first I was inclined to ascribe their enthusiasm to the zeal common to all authors of a new method. After my experimental experience I never doubted that transfusion of cadaver blood may give clinical results in no respect worse than those from using the blood of live donors. The assertion, however, that transfusions of cadaver blood sometimes give even better results than those of blood from live donors seemed to me to be wholly improbable.

Nevertheless, my own clinical experience has convinced me that this fact is really true. It was shown by the quantity and quality of the reactions after transfusion. I realize that our series of 42 cases is still too small for making final conclusions, but the general impression is decidedly in favour of the fact that reactions after transfusing cadaver blood are much rarer and are much less conspicuous. For instance, in all our 42 cases a reaction was seen only six times in very seriously ill patients, principally with diseases of the hæmopoietic system. In no preceding series in our large experience—over 1,000 transfusions using citrated blood as well as the direct method—have we observed so few reactions; in fact, they used to amount to 60 and even 70 per cent. The following case illustrates the contrast between the two methods:—

The patient was suffering from carcinoma in the cæcum, with severe anæmia, in consequence of which he received four transfusions. At the first two he had fresh citrated blood from two donors of a corresponding group, and in both instances the transfusion was accompanied by an extremely strong reaction, with a severe rigor, headache, collapse, and an eruption on the face. At the third transfusion he had 500 c.cm. of blood from a corpse, also of a corresponding group. This was accompanied only by a rise of temperature up to 101°F. There were no symptoms and his general condition was good. Once again he received fresh citrated blood from a new donor of a corresponding group, and this transfusion was again accompanied by a precisely similar reaction—rigor, rash, and collapse.

We used an absolutely identical method of preparing the apparatus, the salt and citrate solutions in all cases of transfusion, so as to exclude the possibility of any difference in the reactions being due to these. How can this be explained?

In six cases the transfusing of cadaver blood was performed without our adding any anticoagulant. The fact, discovered by Skundina, that in some cases there is no coagulation, or rather on the contrary a 'disagulation' of cadaver blood, is in itself of great theoretical and practical interest, and will doubtless be a great advantage for the method. Of the six cases five had no reactions.

The second great advantage of transfused cadaver blood that we have observed is that the increase of hæmoglobin and red cells in the patient is higher than that usually observed after transfusions of an identical quantity of blood from live donors. The following figures show the amount of improvement in a patient with chloranæmia. She had a transfusion of 400 c.cm. of cadaver blood of the corresponding group, which had been preserved for 11 days.

	Before transfusion (28th May)	After transfusion (29th May)	(10th June)
Hæmoglobin ..	33 per cent	40 per cent	53 per cent
Red cells ..	2,300,000	3,000,000	4,250,000
White cells ..	5,200	5,600	6,200

These increases after transfusion of cadaver blood can only be explained by its sharp stimulation of the hæmopoietic system. The action seems to be very variable, and in a number of cases we noted a much milder reaction in the blood count, as shown by a very slight leucocytosis, and by the absence of any great deviation in the Arneth count. These differences of reaction probably depend upon differences in the biological composition, which in its turn may be dependent upon the cause of death of the cadaver from which the blood was taken. These questions still need further investigation.

It is extremely interesting to learn that Professor V. P. Filatov, who is working on transplantation of the cornea, has arrived at a similar conclusion—that the transplanted cornea from the cadaver eye generally 'takes' better than that from a live donor (see *Lancet*, 1937. 1, 1395).

#### ECONOMIC ADVANTAGES

Besides the general value of the method of transfusing cadaver blood has also some advantages from the point of view of organization. In the first place, the dead body can be exonerated from the suspicion of disease with much greater certainty, since the most elaborate examination of a living donor is limited to clinical, serological, and radiological methods, while the post-mortem examination may include an exhaustive pathological investigation of all the organs. The other advantage is on the grounds of economy. The supply is cheap, and with an efficient organization it is possible to have always a stock of this blood in any quantity necessary for clinical needs. As an illustration the following instance will suffice:—

The cadaver was that of a man of athletic constitution, a wrestler, who had died suddenly of cerebral hæmorrhage. Five hours after his death 2,800 c.cm. of blood was taken from him and received into citrate solution. Examination of the blood for syphilis and malaria gave negative results, and bacteriologically it proved sterile. The medico-legal autopsy did not reveal any signs of infectious disease. This blood, after different periods of storing, was transfused into five patients—500 c.cm. on the 8th day of preservation to a woman with secondary anæmia; 500 c.cm. on the 8th day to a patient with pulmonary empyema; 450 c.cm. on the 9th day to a patient with a carcinoma of the stomach; 400 c.cm. on the 11th day to another patient with empyema; and 400 c.cm. on the 11th day to a woman with pernicious anæmia. In all these cases the transfusion had the usual favourable effect.

Thus the analysis of my own material leads me to the conclusion that the method of transfusing cadaver blood has a number of very definite advantages.

It is true, however, that these advantages can be made use of in practice only with widespread and efficient organization for procuring the cadaver blood,

and this is only possible in large centres. In practice the normal organization of transfusing such blood is still meeting a great many difficulties, chiefly from medico-judicial institutions. In spite of the fact that there is a large body of supporting evidence for its value and that full sanction has been obtained for taking blood from cases of sudden death with the observance of certain formalities, the medical men at the courts of justice were unwilling to allow the blood of bodies that are at their disposal to be drawn for clinical needs. Yet here, by an active co-operation with those in charge of local mortuaries, there is opportunity for a further practical development of the method of obtaining cadaver blood.

#### PREJUDICES

There is a strong prejudice in the majority of people at the bare thought of transfusing into a live person the blood from a corpse. One need not, however, go very deeply into these subconscious prejudices to understand that they are of the same order as the days of ordinary blood transfusion.

There is yet another objection put forth by the patient and his relatives. Cadaver blood in the imagination of a simple and narrow-minded person is involuntarily connected with 'ptomaines', corruption, a multitude of microbes, and with the idea that the one to whom this blood has belonged has ceased to exist, and is now exposed to the horrible process of putrefaction. It will be seen therefore that all these notions are thoroughly unscientific, and are associated with the tendency to impart to the blood a whole series of mystic properties connected with the personality of its former host. This conception is also illogical, since in medicine there is now a wide use for blood taken from slaughter-houses, as well as for different organs, prepared in different ways and injected into the veins of a patient. Everyone has become accustomed to this, and nobody protests against it. How much more simple and natural, then, it is to use instead of the blood of a dead animal the blood of a dead human being?

Surely after a certain period man will overcome these prejudices as easily as the numerous others that have arisen during the history of the development of blood transfusion.

#### CONCLUSIONS

The transfusion of cadaver blood seems to be fundamentally established, experimentally as well as clinically. The method is not only equal to other methods of transfusion, applied in clinics, but may even have some advantages over them.

Further advances may be made along the following lines; first, by a more detailed study of the biochemical changes in the blood after its death; secondly, by accumulating further clinical observations; and thirdly, by an efficient organization that will make use of the many opportunities to collect blood from all suitable cadavers.

### The Treatment of Lung Abscess by Means of Guaiacol Intravenously. An Analysis of Twenty Cases

By C. H. NAMMACK, M.D.  
and  
A. M. TIBER, M.D.

(Abstracted from the *Journal of the American Medical Association*, Vol. CIX, 31st July, 1937, p. 330)

THE use of guaiacol intravenously in the treatment of lung abscess was begun in the Fourth Medical Division of Bellevue Hospital in 1922. The results obtained in the early cases were sufficiently encouraging to decide us to make a more analytic study of this method of treatment. In all about fifty cases have been so treated. This article deals with the procedure and

method of carrying out the treatment and presentation of twenty cases.

It has long been noted that creosote, guaiacol and their derivatives have an almost specific action on the secondary infection occurring in open pulmonary tuberculosis but no beneficial effect on the tuberculous process *per se*. The literature on the therapeutic value of these substances in non-tuberculous lung infections is scant and indefinite. The purpose of this study was to investigate the effects of one of these substances, guaiacol, on the course of acute and chronic non-tuberculous lung abscess.

#### CHEMICAL INVESTIGATION

Guaiacol, a phenol ester, was isolated in crystalline form in 1887 by Behal and Chosy.

It is a colourless or yellow crystalline mass which darkens on exposure to air or light, melts at 28°C. and remains liquid for a long time even at lower temperature, boils at 204°C., is insoluble in water and has an agreeable aromatic odour. Attempts to reduce its toxic and irritating properties by esterification have resulted in the preparation of numerous derivatives, many of which are soluble and practically innocuous.

If guaiacol or any of its esters is to have any direct action on any pathologic condition in the lungs, it is reasonable to expect that it will be excreted through them. Bufalini in 1904 reported that guaiacol, when administered orally, was not excreted through the lungs. In 1915 Hofbauer showed that, when injected hypodermically, guaiacol was found to be present in large amounts in the blood, liver and spleen and somewhat less in the lungs and kidneys. It is evident then that, in order to reach the lungs, guaiacol or any of its esters must be introduced by either the hypodermic or the intravenous route.

Because solutions of guaiacol or its esters are somewhat irritating when given hypodermically, intravenous injections are preferred. Thus, the only derivatives of guaiacol that can be used in this study must be readily soluble in water.

Of the water-soluble derivatives, potassium guaiacol sulphonate and calcium guaiacol sulphonate are the most readily available and have been used most extensively. However, these esters are inactive and must be saponified into their constituents and the active principle, guaiacol, liberated. When an aqueous solution of either of these compounds is administered intravenously, guaiacol can be recovered in the sputum, but the amount recovered is very small compared with the amount actually injected. It is evident then that, in order to obtain a large amount of guaiacol in the sputum, free guaiacol should be injected intravenously. However, guaiacol is insoluble in water; but if from 5 to 10 grains (0.3 to 0.65 gm.) of pure guaiacol is dissolved in from 1 to 2 c.c. of 95 per cent ethyl alcohol the guaiacol can be dissolved in an aqueous solution containing 2½ grains (0.16 gm.) of sodium iodide. If either the guaiacol is precipitated out and can be redissolved only by the addition of more alcohol.

A solution of from 5 to 10 grains of guaiacol, 2 c.c. of ethyl alcohol and 18 c.c. of water containing 2½ grains of sodium iodide is stable and will keep in a dark container for a number of months before the guaiacol will precipitate out.

This solution was prepared for us by various companies and is the solution that gave the best results. This solution is somewhat irritating to the subcutaneous tissues and should be injected only after the blood has welled into the syringe.

#### PULMONARY EXCRETION OF GUAICOL

The sputums of patients with definite lung abscesses were collected for three consecutive twenty-four-hour periods. Each sample was measured, acidified and distilled with steam and the distillate was collected in 20 c.c. portions. Each portion was tested with Millon's reagent for the presence of free phenol and if free phenol was found only in the first 20 c.c. of the distillate, it was termed one plus; if in the first and second



two plus; if in the first, second and third, three plus, and in all four, four plus. The same procedure was followed after each patient was given an intravenous injection of 20 c.c. of guaiacol solution.

When a solution containing free guaiacol is given intravenously to patients with lung abscesses, their sputums for from forty-eight to seventy-two hours after the injection contain a substance which gives a positive reaction with Millon's reagent. In view of the fact that no phenol bodies were present in the sputums of these patients for four consecutive days prior to the intravenous administration of guaiacol, it is reasonable to assume that the phenol body present in the sputum after the injection is guaiacol or a derivative of it.

While these experiments were being conducted, a patient with a putrid lung abscess was operated on in our surgical division (thoracotomy). It was deemed wise to examine chemically the drainage from the lung for the presence of volatile phenols. The drainage was collected for two consecutive days and the dressings and drainage distilled with steam. The distillate was collected in 20 c.c. portions as described previously and each portion tested with Millon's reagent. The patient was then given an intravenous injection of 20 c.c. of the guaiacol and iodide solution and the drainage and dressing for the next seventy-two hours collected and treated as before.

The drainage from the lung abscess cavity contained no volatile phenol bodies; but, following the intravenous administration of the guaiacol solution, the drainage from the abscess cavity contained a volatile phenol which gave a positive reaction with Millon's reagent. It is evident, then, that when guaiacol is injected intravenously it is excreted through the lungs of patients with lung abscesses as a volatile phenol body.

#### Summary of treated cases with two- to five-year follow up

		Total	Cured	Deaths
Cases	..	20	16	4
Duration of symptoms				
Less than 3 months (acute)	..	8	8	0
More than 3 months (chronic)	..	12	8	4
Site of abscesses				
Solitary				
R. U. L.	..	10	9	1
R. M. L.	..	0	0	..
R. L. L.	..	2	2	..
L. U. L.	..	4	3	1
L. L. L.	..	2	2	..
Multiple				
R. U. L., L. L. L.	..	1	0	1
L. U. L., L. L. L.	..	1	0	1
Alcoholic	..	10	..	2
Non-alcoholic	..	10	..	2
Condition of gums and teeth				
Healthy	..	5	5	..
Suppurative gingivitis	..	15	..	..
Treated (11)	..	11	11	..
Untreated (4)	..	4	0	4
Age distribution				
20-29 years (3rd decade)	..	1	..	..
30-39 years (4th decade)	..	7	..	2
40-49 years (5th decade)	..	8	..	..
50-59 years (6th decade)	..	4	..	2
Sex				
Male	..	17	..	2
Female	..	3	..	2

#### TREATMENT

The following routine was adopted for the treatment of patients with acute or chronic lung abscesses:—

1. Bed rest if the rectal temperature was above 99.8°F.
2. Twenty-four-hour collection of sputum.
3. Temperature taken every four hours.

4. X-ray films of chest, in postero-anterior, lateral and oblique positions; repeated every three to four weeks.

5. Examination of teeth and careful mouth hygiene and extraction of decayed teeth if necessary.

6. Bronchoscopy soon after admission.

7. No tobacco or alcoholic drinks.

8. High caloric diet.

9. Intravenous injection of guaiacol every third or fourth day. All patients were given the solution until the amount of the sputum was reduced, its foul odour disappeared and the general condition of the patient improved.

10. On discharge the patient was sent to a convalescent home and not permitted to resume work until the roentgenograms revealed complete healing.

The summarized results of twenty treated cases are shown in the table above.

#### COMMENT

The results have been satisfactory and it is noteworthy that Unger using an injectable guaiacol solution obtained similar results at the Rudolf Virchow Hospital in Berlin. In the present study of twenty treated cases, it was found that the patients felt considerably better in a very short time, owing to the subsidence of the fever and cough and to the decrease of the daily sputum output and the loss of its foul odour. Serial roentgenograms showed early regression of the large area of pneumonitis surrounding the abscess cavity and later its actual disappearance.

It is felt that the eradication of all foci of infection about the mouth, nose and throat and moderate restriction of all activities until the roentgenogram shows complete healing is very essential if the results of this type of treatment are to be permanent. Of the four deaths in this series, one was due to a malignant condition of the lung, one to traumatic subdural hæmorrhage, and two to recurrence of the abscess. It is well to point out that the abscess reappeared in those patients who refused to have their infected gums treated.

Because many lung abscesses heal spontaneously and because of the danger of early operation, most authorities agree that acute lung abscesses should be treated medically from six to twelve weeks before any surgical procedures are resorted to. Yet, after reviewing the literature, one is impressed with the lack of active medical treatment during this period. As the intravenous use of guaiacol causes early subsidence of the symptoms and a regression of the pathologic condition in the lung without producing any unfavourable reactions, it appears that this type of therapy should be used in the treatment of patients with acute and chronic lung abscess.

#### Use of Prostigmin as a Diagnostic Test of Myasthenia Gravis

By G. D. GAMMON, M.D.

and

H. SCHEIE

(From the *Journal of the American Medical Association*, Vol. CIX, 7th August, 1937, p. 413)

THAT prostigmin relieves the muscular weakness of myasthenia gravis has now been accepted quite generally by all observers who have studied the drug. The relief, furthermore, has provided new insight into the mechanisms at fault in the disease. The possibility of using the response to prostigmin as a diagnostic test of myasthenia has not, however, been fully appreciated. It is true that Viets and Schwab have found that the weakness due to lesions of the central and peripheral nervous system was not materially improved. However, the effect of prostigmin on the muscular diseases has not been systematically studied. We have accordingly examined the action of the drug on the weakness due to a variety of diseases of the muscular system. None of the patients obtained any striking relief from

prostigmin. Therefore myasthenia gravis is the only condition examined thus far in which muscular weakness is consistently and markedly improved. For this reason it seems fair to conclude that a response to prostigmin may be used as a diagnostic test of the disease.

#### MATERIAL AND METHODS

The cases studied include four cases of myasthenia gravis, in one of which hyperthyroidism had developed; five cases of progressive muscular dystrophy; two cases of myotonic dystrophy; one case of family periodic paralysis; two cases of amyotonia congenita; five normal adults, and three normal children. The patients were studied in the Neurological, Medical and Pediatric services of the University Hospital; diagnoses were made after careful study.

In estimating changes in muscular contraction we observed facial movements and, wherever possible, we employed such objective tests as weight lifting, dynamometer tests and the height to which a mercury column could be blown. In some cases myographic records were made.

As a test dose from 1.5 to 2 mg. of prostigmin hypodermically was used, combined with atropine sulphate 1/100 grain (0.00065 gm.). It should be emphasized that a large dose is required to obtain the desired response. Children tolerate about half the adult dose.

#### EFFECTS OF PROSTIGMIN IN CASES OF MUSCULAR DISEASE AND MYASTHENIA IN NORMAL PERSONS

Prostigmin in doses ordinarily employed in the treatment of myasthenia sets up marked fibrillary tremors in the muscles of normal persons and in all these cases of muscular disease except myasthenia. While best seen in the eyelids and tongue, the fibrillations occurred irregularly throughout the body and did not selectively affect the diseased muscle. The twitching probably

results from repetitive contraction of small groups of fibres in response to tonic impulses, since Brown, Dale and Feldberg have observed that muscle treated with physostigmine gives a multiple response to a single stimulus applied to the motor nerve. In the muscular dystrophies the twitching was considerably more marked than in normal persons, indicating probably an increased sensitivity to the drug. In myasthenia gravis, in contrast to these cases, fibrillations almost never occurred; only rarely were they observed in the lids. The absence of a normal reaction suggests that the myasthenic process is generalized and widespread.

While the lack of fibrillary twitching distinguished myasthenia from the other cases examined, a much more striking difference was evident. For the weakness of myasthenia was consistently and spectacularly relieved, but that of the other conditions was either not materially affected or, in some cases, was slightly increased. Thus only one of the seven patients with dystrophy obtained an increase in strength and this was so slight as to require careful measurement to demonstrate the change. The patient with periodic family paralysis was made somewhat weaker.

Thus, of the various muscular diseases that we examined, myasthenia gravis alone responded to prostigmin with significant increase in the strength of muscular contractions. Since, then, others have shown that weakness due to lesions in the central and peripheral nervous systems is also not materially improved by prostigmin, a marked improvement in muscular weakness by prostigmin and the absence of fibrillary tremors is a diagnostic test of myasthenia. In other words, prostigmin appears specific for myasthenic weakness, since it relieves no other condition so far examined. It is possible that prostigmin may find its widest usefulness as a test to differentiate myasthenia from other causes of muscular weakness.

## Reviews

**MEDICINE: ESSENTIALS FOR PRACTITIONERS AND STUDENTS.**—By G. E. Beaumont, M.A., D.M. (Oxon.), F.R.C.P., D.P.H. (Lond.). Third Edition. 1937. J. and A. Churchill, Limited, London. Pp. xviii plus 780, with 74 illustrations. Price, 21s.

THIS is a very 'cheerful' textbook of medicine and one that we think will appeal to most students. Probably not all medical students are as sensitive as the reviewer is to the format of a book, but we are sure that many are, and Messrs. J. and A. Churchill have a happy knack of producing books which lack entirely that gloomy and depressing effect of some textually excellent books; but even they could not make bricks without straw and Dr. Beaumont has given them a good supply of the most suitable straw for the purpose.

Additions have been made but most of the new sections are on rare and obscure diseases which we suppose the student must read about, but his burden is already a heavy one. On the other hand, some of the subjects that have been revised are important ones and the revision has been well done; agranulocytosis is a good example of this class.

New therapeutic agents have been introduced into the text; amongst these we notice that neostibosan has made a somewhat belated debut. Sulphanilamide compounds, however, e.g., prontosil, a much more recent arrival, have been mentioned under a number of headings, but no particular warning has been given on the dangers of some of the compounds of this group.

Tropical diseases have been fairly well served, as they were in the last edition. Compression was necessary and it is easy to be critical, but was it necessary to mention *Leptospira icteroides* in connection with yellow fever? As it is mentioned, the mistake that led to its

association with yellow fever should have been explained, for the reader will gather from the statement as it now stands that this organism is in some way associated with the aetiology of yellow fever and also with that of Weil's disease.

(1) Locality and (2) climate are given as the only two predisposing causes for a number of tropical diseases. The impression conveyed is that the author had a standard heading, predisposing causes, and had to fill it somehow. Plasmochin is dismissed as being toxic and not as good as quinine, apparently without any understanding of its unique place in the therapeutics of malaria.

On the whole, it is one of the best of the short textbooks of medicine and we can recommend it to students, teachers and practitioners.

L. E. N.

**AN OUTLINE OF GENERAL PHYSIOLOGY.**—By L. V. Heilbrunn. 1937. W. B. Saunders Company, Philadelphia and London. Pp. 603. Illustrated. Price, 21s.

THOUGH physiology in its widest sense signifies the study of the phenomena presented by all living organisms, the subject has been generally taught with special reference to its application to the human body and its component organs and tissues. Our knowledge of the physiology of other forms of life, viz, plants or insects, has consequently been very meagre and this is reflected in the teaching of physiology in the school curriculum where the subject of 'general physiology' as opposed to 'organ physiology' is constantly relegated to the background. Of late, however, there is a growing tendency to know more about the fundamental nature and mechanism common to the whole of the living

world, and modern physiologists have turned in increasing numbers to study the underlying unity of all vital processes, in order to explain many hitherto obscure phenomena of life. It is undoubtedly important that modern students of physiology should have a better background of the principles of general physiology before he is allowed to proceed further with studies of mammalian and human physiology. A great handicap has been the want of a suitable treatise on the subject. The few texts that are available, including the remarkable book by Bayliss, have not been brought up to date. The appearance of the book by Professor Heilbrunn is therefore very opportune and is likely to be welcomed by students and teachers alike.

The book falls into four natural divisions. After a brief description of the morphology of the cellular structure of the organism, the author has considered the activities of the living machine from three different aspects: first, from the standpoint of the chemical reactions involved in its activity (chapters I to XIII); second, from the standpoint of energy interchange (chapters XIV to XXX); and lastly, from the standpoint of the environment and its effect on the living organism (chapters XXXI to XL). These three sections form the major part of the book and the concluding chapters are devoted to the problem of age and death and the question of reproduction and cell division. General physiology is a borderline subject and it requires a good deal of judgment to keep it free from too much physical chemistry on the one hand or too much mammalian physiology on the other hand. The author is to be congratulated on the admirable way in which he has presented the subject-matter. The only criticism is in connection with the first two sections of the book where the subject-matter has been too much condensed and abridged. Some of the chapters in these sections, particularly those dealing with the physical chemistry of the protoplasm and the kinetics of living matter, may well bear further amplification for the benefit of students. The third section on environment and acclimatization is well written but probably will appear to be a little too abstruse for the student.

The book is crammed with all pertinent and recent information on the subject. The presentation is lucid considering the numerous and frequent citations to the existing literature and the different chapters are correlated in a satisfactory manner. The references are up to date and the illustrations are executed well. The book is worthy of the attention of all teachers and progressive students of modern physiology.

B. M.

**APPLIED PHARMACOLOGY.**—By A. J. Clark, M.C., M.D., F.R.C.P., F.R.S. Sixth Edition. 1937. J. and A. Churchill, Limited, London. Pp. x plus 678. Illustrated. Price, 18s.

Few books on pharmacology have been so much in the forefront during the last decade as 'Applied Pharmacology' by Professor A. J. Clark of the Edinburgh University. Since its first appearance in 1923, the book has passed through six editions, has been reprinted once in 1935 and has been translated into two foreign languages—a fact which testifies in no uncertain terms to the tremendous popularity the book enjoys and the useful purpose it is serving in the cause of pharmacological teaching and education. Although the last edition appeared only two years ago, recent advances in the various branches of physiology, pharmacology and therapeutics have necessitated a new edition.

In this edition, a large amount of new material has been incorporated and the text has been revised and rewritten in many places. A noteworthy feature is the complete rearrangement of the order of the book. Some of the chapters on 'Disinfectants', 'Specific therapeutics', 'Anthelmintics', etc., have been shifted towards the latter part and the chapters on the 'Autonomic Nervous System', 'Vitamins', etc., have been brought forward into the earlier sections. This

has been done, as the author explains in the preface, to bring into prominence the modern viewpoints 'on the subject of 'Auto-pharmacology'. One of the landmarks in modern pharmacology is the establishment of the theory of Löewi that the autonomic nervous system regulates the activities of plain muscles and of glands by the release of acetylcholine and adrenaline and it seems very important that in all up-to-date books the subject should be given proper emphasis. The chapters on the 'General principles of drug action', 'Endocrine glands' and 'Vitamins' have been considerably modified and strengthened. A number of newer drugs have received attention, chief amongst which may be mentioned acetyl- $\beta$ -methyl choline, doryl, ethylene, cyclopropane, many hypnotic and anaesthetic drugs, diuretics and urinary antiseptics. Several new figures have been added of which nos. 47 and 48 in connection with the section on 'Shock due to burns' deserve special notice.

Professor Clark has achieved the enviable distinction of maintaining intact in this edition the scientific and critical spirit of the earlier editions and has enhanced considerably the scope and usefulness of the book. There seems little doubt that the present edition will meet with as eager a welcome as its predecessors have received in the hands of teachers and students alike.

B. M.

**DISORDERS OF THE BLOOD, DIAGNOSIS, PATHOLOGY, TREATMENT AND TECHNIQUE.**—By L. E. H. Whitby, C.V.O., M.C., M.A., M.D. (Cantab.), F.R.C.P. (Lond.), D.P.H., and G. J. C. Britton, M.D. (New Zealand), D.P.H. Second Edition. 1937. J. and A. Churchill, Limited, London. Pp. xii plus 582, with 12 plates (8 coloured) and 60 text-figures. Price, 21s.

The first edition of this book came at a very opportune moment, just at a time when a number of physicians and research workers were turning their attention to blood diseases and were finding the absence of a good and comprehensive book on the subject a great handicap. Judging by the number of times we have seen this book quoted we should say that it has been an exceptionally popular one in more than one country. As a standard book of reference we have found it invaluable, and the arrival of the second edition within two years was a welcome surprise.

Extensive revisions have been carried out in this second edition: in some instances these were necessitated by advances of knowledge, but more often they were undertaken in order to take advantage of opportunities for improving the book which the authors themselves saw or which were pointed out to them by friends or critics. In this we claim some share and we notice that some mistakes pointed out by us have been corrected: on the other hand we still think it was quite unnecessary, in a book of this kind, to include any reference to tropical diseases, such as filariasis, trypanosomiasis and leishmaniasis, beyond a short description of the blood picture associated with these infections, as has been done for pneumonia, typhoid and other cosmopolitan diseases. It seems such a pity to mar an otherwise excellent book by the inclusion of useless, inaccurate and out-of-date information, when even if it were adequate, accurate and up to date it would be quite out of place.

The subject of the megaloblast is one on which there are many opinions, but we cannot see on what grounds the authors claim that the hæmoglobinized cell, A, on plate III, with a characteristic erythroblast nucleus is a megaloblast. Nor can we agree that the diameter of the megaloblast is 10 to 12  $\mu$ .

Amongst the additions and improvements in edition are a table of hæmoglobin standards, a showing the expected reticulocyte response at initial hæmoglobin levels and another showing the expected reticulocyte response to different liver extract as a constant initial hæmoglobin level, a table showing the iron content and percentage absorption of different iron preparations, and

information on the technique of cell measurements, and on bone trephining and sternal puncture. There are also some new and very useful plates, including one showing the colour taken up by various cells after supravital staining.

This second edition is a considerable improvement on the first and the standard of that was very high. The book will supply the needs of the physician and the medical investigator in a way that no other book on the same subject will do.

L. E. N.

**PULMONARY TUBERCULOSIS IN PRACTICE: A MODERN CONCEPTION.**—By R. C. Wingfield, B.A., M.B., B.Ch., F.R.C.P. 1937. Edward Arnold and Company, London. Pp. viii plus 122. Illustrated. Price, 9s.

THE conception of this book was an excellent one. Specialization leads to an advancement of knowledge but also segregation of that knowledge amongst the select few. The present book is an attempt to counter this second, and unfortunate, tendency. Short though it is the book is divided into three parts; in the first the gross pathology of pulmonary tuberculosis is explained with the aid of diagrams demonstrating the twelve different stages of the disease with which the practitioner is likely to be concerned; in the second, the clinical aspects of these twelve different stages are dealt with; how the practitioner is to recognize them and what treatment he is to institute or advise; and in the third part are individual chapters on 'special aspects of the treatment of chronic pulmonary tuberculosis', e.g., Mantoux test, pleural effusion and spontaneous pneumothorax.

We have a few minor criticisms. The specialist delights in symbols, but let him keep them to himself. They are dangerous toys in the hands of students. We suffer in this country from—'the patient was an N. case'; the note-writer even having neglected to mention that leprosy was the disease from which the patient was suffering. Must we now have 'he was a TIX case of TB'. The author has used the adjectives tubercular and tuberculous indiscriminately as if they were synonymous. In a simplified scheme it is unfortunate that the word 'secondaries' meaning one thing and the words 'secondary infections' meaning something quite different should have to be used; we cannot, off-hand, think of a way of avoiding the inevitable confusion, but then we are not writing the book.

Nevertheless, the book will serve the purpose for which it is designed very well indeed; the descriptions are clear and the diagrams and illustrations are appropriate and useful; they do not 'make up for defects in my literary style', as the author modestly suggests, but they further clarify an already lucid one.

The book is written for the student and the practitioner but we further recommend it to the teacher.

L. E. N.

**THE DIAGNOSIS OF NERVOUS DISEASES.**—By Sir James Purves-Stewart, K.C.M.G., C.B., M.D. (Edin.), F.R.C.P. Eighth Edition. 1937. Edward Arnold and Company, London. Pp. viii plus 842. Illustrated. Price, 35s.

THIS is one of the most popular books on the diagnosis of nervous diseases in the English language and the fact that a work dealing with such a complicated subject as neurology has had to pass through its eighth edition proves how it has been received by the medical public. Although the main scheme of the book remains the same, all new facts which have been revealed by experimental and clinical work have been included and thus the author has brought the work thoroughly up to date. Considerable portions of this edition have been rewritten and about 25 new illustrations have been added. As a result, the book has increased in size by more than 100 pages. But this has in no way made it too big or unwieldy.

It is a pleasure to be asked to review a book which is a typical British production and which embodies all

that is taught by British neurologists. Every subject has been dealt with in a very comprehensive manner supported by anatomical, physiological and pathological knowledge, and profusely illustrated by figures and also photographs from actual cases. The method of presentation is so practical and the matter is couched in such language that even prolonged reading never becomes irksome and one feels as if he is actually dealing with a case. The book is therefore wholeheartedly recommended not only to every student of medicine but also to all practitioners.

It has to be mentioned with some regret that the pasting of an errata slip at the very start mars the excellence of an otherwise perfectly executed work and we hope both the author and the publishers will pay more attention to proof reading in order to prevent its repetition in the next edition of the book.

M. N. D.

**THE BASIS OF CLINICAL NEUROLOGY. THE ANATOMY AND PHYSIOLOGY OF THE NERVOUS SYSTEM IN THEIR APPLICATION TO CLINICAL NEUROLOGY.**—By Samuel Brock, M.D. 1937. Baillière, Tindall and Cox, London. Pp. viii plus 360, with 72 figures. Price, 21s.

THE application of the knowledge of the basic sciences in the successful understanding of human illnesses, though absolutely essential, is no doubt somewhat difficult. This is particularly so in the study of the diseases of the nervous system. Professor Samuel Brock, who has devoted his time to the study of neurology, having appreciated this difficulty, has been obviously prompted to write this book in which he intends to present neuro-anatomy and neuro-physiology mainly from the standpoint of clinical usefulness. The author is to be congratulated as the volume has certainly fulfilled his mission to a very great extent.

Having devoted a few pages to introductory remarks and to the consideration of the anatomy and physiology of the peripheral nervous system, the author proceeds with the description of the spinal cord and the brain, which occupies the major part of the book. The last four chapters deal with the blood supply of the brain, cerebrospinal fluid, the sympathetic nervous system and posture. Throughout the text the author has tried his best to present the subject-matter in such a practical way as to be most useful for clinical investigations. The book is profusely illustrated with diagrams which are not only instructive but also very impressive. In most places where theoretical questions on recent works have to be discussed, the author has put them in the form of brief summaries in which he has noted the opinion of different workers without entering his own views in a dogmatic way. In some places he has perhaps exceeded the limits of neuro-anatomy and neuro-physiology and perhaps unconsciously, in his eagerness, transgressed into theoretical discussion of controversial subjects. While describing the vascular supply of the brain, the writer might put in some suitable diagrams for the sake of illustration. On the whole, however, it is an excellent book on applied neuro-anatomy and neuro-physiology published in the English language.

M. N. D.

**THE COMMON NEUROSES: THEIR TREATMENT BY PSYCHO-THERAPY. AN INTRODUCTION TO PSYCHOLOGICAL TREATMENT FOR STUDENTS AND PRACTITIONERS.**—By T. A. Ross, M.D., F.R.C.P. Second Edition. 1937. Edward Arnold and Company, London. Pp. xii plus 236. Price, 10s. 6d.

THIS is an excellent book on the common neuroses written with the belief that the great bulk of the functional nervous disorders can be treated successfully by the general practitioner who meets these conditions very commonly on his daily rounds. As he knows far more than anybody else about his patients so far as some of the important factors in the aetiology of the common neuroses are concerned, the general practitioner

should be the proper person to take them up for treatment. The book will therefore be found admirably suited for this purpose. The value and usefulness of the book will be all the more appreciated because it has been written by one who has devoted twenty years of his life to the study of these cases and who has recorded his personal observations during such a long period. While writing on the subject he has taken every care to limit his observations in such a way that the general practitioner will be able to decide how far he can manage by himself and how far he should refer to the expert psychologist. One important feature of this edition is the omission of the chapter on Freudian methods. This is undoubtedly a move in the right direction as such a serious work is better left to a specialist rather than trusted to a busy general practitioner.

The entire subject has been presented in such a practical manner that the volume will be found to be a very useful guide to students and particularly to general practitioners to whom it is highly recommended.

M. N. D.

**DISEASES OF THE SKIN: A MANUAL FOR STUDENTS AND PRACTITIONERS.**—By the Late Robert W. MacKenna, M.A., M.D., Ch.B. (Edin.). Fourth Edition. Revised and Enlarged by R. M. B. MacKenna, M.A., M.D. (Camb.), M.R.C.P. (Lond.). 1937. Baillière, Tindall and Cox, London. Pp. xiv plus 557, with 168 illustrations and 46 coloured plates. Price, 20s.

It is five years since the appearance of the third edition of this excellent book on dermatology. In that period the advances in our knowledge of the finer chemical reactions occurring in the body and their bearing on health and disease have thrown a good deal of light on the ætiology and treatment of certain skin diseases so that textbooks on this subject need revision.

The author of this book has carried out his task as well in producing this fourth edition as he did in revising the original edition written by his father, for by careful alteration and rewriting of certain sections he has incorporated a great deal of fresh information without increasing the length of the book to any great extent. In one particular, the life history of *Sarcoptes scabiei*, Dr. MacKenna himself has made a direct contribution to dermatology, for he has shown that the old and universally accepted ideas on this subject need drastic revision.

In the preface he has effectually replied to certain critics of the earlier editions, that there is no long list of references, by expressing the opinion that it is more important to keep the price of the book within reasonable limits for the many than to provide a large number of references for the satisfaction of the few. We are in complete agreement with this statement because references in textbooks are rarely made use of by practitioners either for want of time or more often for lack of opportunity, as the majority of doctors in general practice are not in touch with a large medical library which is the only place where full use can be made of references to journals and books. He has been eminently successful, as at the price of twenty shillings this book gives remarkably good value.

The faculty of using English clearly and in a manner pleasing to the reader has descended from the father to the son and the present edition might well have been written by the former who was a writer of greater capacity than the average medical man, as he wrote, and wrote well, a few works of fiction in addition to his valuable contributions to medical literature.

The colour plates and photographs have been carefully chosen for their educative value and they are beautifully reproduced, and the whole book is produced in the best style of this well-known firm of medical publishers. In our opinion this book may be summed up as probably the most useful medium-sized English book on dermatology for the guidance of the general practitioner.

P. A. M.

**NEUROLOGICAL SURGERY.**—By Loyal Davis, M.S., M.D., Ph.D., D.Sc. (Hon.). 1936. Henry Kimpton, London. Pp. 429. Illustrated. Price, 28s.

THIS is a handy volume written primarily for the needs of the general practitioners who are frequently called upon to see neurological cases. That, to a very appreciable number of general practitioners, the neurological case appears shrouded in an inexplicable perplexity, its prognosis difficult and its treatment almost hopeless, is undoubtedly to a large extent due to a lack, however regrettable, of a working knowledge of the nervous system.

The author, a distinguished specialist in the line, has written the book to remove these difficulties and presented the fundamentals of neuro-anatomy and physiology and such details of various pathological conditions, which are usually met with, in an interesting and readable form which is sure to be appreciated by all practitioners. We have little doubt that the perusal of the book will enable one to face neurological cases with less efforts but greater confidence, and to treat or advise with better precision.

With a brief but fairly comprehensive outline of basic anatomical and physiological essentials for diagnosis in the first chapter, the commoner pathological conditions have been treated on a regional basis, in the succeeding chapters. Though primarily meant for attending doctors only, many surgical operations minus technical details have been aptly incorporated; this, we believe, has added to the merit of the book, in so far as it will enable practitioners to estimate the seriousness or otherwise of a particular operation to be advised.

Chapters X and XI are devoted to fairly detailed discussions on modern conceptions of anatomy of the autonomic nervous system and the anatomy and physiology of pain. Not only have various operations performed on this section of the nervous system for the relief of visceral pain been discussed but, what is more, their limitations have been pointed out, to enable one to advise correctly his patient whether or not a cure or permanent relief can be guaranteed. These, we have no doubt, will be read with profit by those who are prone to be carried away by anything new in the field.

Though intended for general practitioners we feel the book will have a far more extended use and will be a profitable addition to any medical library.

We have nothing but praise for the lucid text of the book in which a wide range of the subject has been creditably condensed, but we wish the book had passed through a more careful proof reading to remove the many printing mistakes that have crept into the main text, as well as in the references.

Nevertheless, the get-up of this book, the printing and the paper are indeed satisfactory and we have little doubt that it will be welcomed by those for whom it is meant.

We commend this book to all advanced medical students and practitioners.

S. C. S.

**PHYSIOLOGY AND PATHOLOGY OF THE HEART AND BLOOD VESSELS.**—By John Plesch, M.D. (Budapest), M.D. (Germany), L.R.C.P. & S. (Edin. and Glas.). 1937. Oxford University Press, London, Humphrey Milford. Pp. xiii plus 188. Illustrated. Price, 15s. Obtainable from Oxford University Press, Bombay and Calcutta

THE book is divided into two parts: part I deals with the physiology of circulation, while part II deals with its pathology. The mechanism of circulation of the blood has been explained by application of the principles of hydraulics. The author deduces certain fundamental mathematical formulæ by means of which he explains the regulation of blood flow through the organs. This method opens a new avenue for further work in this line, by means of which the physiology and pathology of the circulation can be placed on a more stable and scientific basis. The portion dealing



with the conception of 'back-pressure' is worth mentioning.

P. D.

**THE SCIENCE AND PRACTICE OF SURGERY.**—By W. H. C. Romanis, M.B., M.Ch. (Cantab.), F.R.C.S. (Eng.), F.R.S. (Edin.), and P. H. Mitchiner, M.D., M.S. (Lond.), F.R.C.S. (Eng.). Volumes I and II. Volume I: General Surgery. Volume II: Regional Surgery. Sixth Edition. 1937. J. and A. Churchill, Limited, London. Pp. x plus 808 and index 75 in volume I and x plus 978 and index 75 in volume II with 800 illustrations. Price, 14s. for each volume

The Coronation edition of Romanis and Mitchiner's Surgery has just been published. No introduction is necessary for this popular and well-known book on surgery. It has the proud record of six editions in one decade. This, indeed, is an eloquent testimony to its utility.

Many changes have been made in this edition to bring the book into line with established surgical practice. The section on the sympathetic nervous system has been entirely re-written and there are several alterations in the chapters on cranial and urological diseases. A new section has been added on the medical aspects of 'gas', which is a grim sign of the times!

The chapters on fractures and dislocations have been thoroughly revised but Bohler's methods, rightly, have not been rigidly insisted upon. The authors feel that these may well be difficult, if not impossible, for the general practitioner in many instances. The chapters on x-rays, radiotherapy and anæsthetics have also been brought up to date.

We are confident that this book will continue to be useful, not only to the medical student, but also to the post-graduate worker going up for higher surgical qualifications and the general medical practitioner. We have much pleasure in recommending this edition to all teachers and students of surgery. The printing, get-up and illustrations are all excellent. There is a useful index in each volume.

P. N. R.

**THE LARYNX AND ITS DISEASES.**—By C. Jackson, M.D., Sc.D., LL.D., F.A.C.S., and C. L. Jackson, A.B., M.D., M.Sc. (Med.), F.A.C.S. 1937. W. B. Saunders Company, Philadelphia and London. Pp. 555, with 210 illustrations, some in colour. Price, 35s.

It is not possible in the course of a short review to do justice to a book of this kind. It is of so intensely practical a nature that it must be read in the original to be fully appreciated. It is a very worthy companion to that other excellent work 'The Nose, Throat and Ear and their Diseases' by Chevalier Jackson and Coates.

In fact these two books now form a complete work of reference in otorhinolaryngology.

As the authors say, 'A new era has dawned. The day of inferential diagnosis of diseases of the larynx is past. It is now realized that the larynx of any human being from the new-born babe to the century old can be examined in its entirety'.

They make out a very strong case in favour of the routine use of the direct laryngoscope in asphyxia neonatorum.

'The up-to-date practitioner now considers it essential to exclude laryngeal obstruction before maltreating a new-born babe to make him breathe'.

The cause of 'blue baby' is in the authors' opinion seldom due to a patent foramen ovale, but is nearly always due to some form of laryngeal obstruction which can be diagnosed and treated by means of the direct laryngoscope.

The authors define and describe as a distinct morbid entity a new disease which they call 'myasthenia laryngis'. It is a very common disease though it is also very commonly overlooked.

It is a weakness of the laryngeal muscles especially affecting the thyro-arytenoideus. Almost all professional

users of the voice, such a clergymen, singers and evangelists, end their career by the giving out of the voice and the cause is practically always myasthenia laryngis.

Now the practical significance of all this is (and this book is nothing if it is not practical) that the treatment is by complete vocal rest and not by a further course of laryngeal gymnastics as is so commonly prescribed by voice teachers.

The motor palsies of the larynx are described fully and very clearly.

The various operative procedures on the larynx are described with a wealth of practical detail.

For example, the instructions to a nurse in charge of a tracheotomized patient run into a list of twenty items. The methods of 'decannulation' are fully described. This sequel of the operation of tracheotomy is usually overlooked in the ordinary textbook.

The illustrations and especially the coloured drawings are beyond all praise. They are the work of an artist who has himself had a unique practical experience of the conditions he portrays.

This book will be invaluable not only to the specialist but also to the general practitioner.

It makes pleasant reading and this is enhanced by the historical notes at the end of each chapter.

H. S. C.

**OPERATIVE SURGERY: THE EAR, AIR PASSAGES AND NECK.**—By Dr. M. Kirschner with the collaboration of A. Lautenschlager and Dr. O. Kleinschmidt. Authorized translation by I. S. Davdin, B.S., M.D., and G. M. Coates, A.B., M.D. Volume III. 1937. J. B. Lippincott Company, Philadelphia and London. Pp. xii plus 528, with 460 illustrations, mostly coloured. Price, 50s. Obtainable from Messrs. Butterworth and Company (India), Limited, Calcutta. Price, Rs. 37-8-0

This book, the third volume of the series 'Operative Surgery' (Kirschner), consists of 528 pages, most of which contain at least one illustration. It is divided into two parts: part I consisting of operations on the ear, nose, larynx and pharynx which has been written by A. Lautenschlager of Berlin, and part II consisting of operations on the œsophagus and neck and written by O. Kleinschmidt of Wiesbaden.

Despite the wide nature of the field which it has to cover, this has been done very thoroughly. Operative technique is clearly and adequately described and the illustrations, which may be said to be a feature of the book, are beautiful and of a very high degree of accuracy. While generally every operation is dealt with fully there are a few operations, notably those on the cervical lymph nodes and on cervical cysts and fistulæ, which might have been given more space. The general value of the book too would be increased if operative indications were given more prominence and if the results to be expected were more frequently stated.

Certain statements cannot be allowed to pass without comment. In the chapter devoted to operations on the thyroid it is stated that 'only in rare cases will a resection of the isthmus have to be considered', and later 'resection of the isthmus impairs the nutrition of the remaining goitre'. This is not likely to be in accordance with the practice or the experience of the majority of British surgeons. It is only fair to add that the translator, I. S. Ravdin, records his disagreement with this view. It is to be noted also that in many of the operations on the neck, especially those in connection with the ligation of arteries, the exposure of nerves, and the removal of lymph, the usual incision advocated is a vertical one. Surely a transverse incision which gives just as adequate an approach would be better.

As might be expected from a book which is essentially Continental and especially German in its surgery, the technique in several instances differs considerably from that of surgeons of the British school. For example, the method of choice for the performance of tracheo-bronchoscopy seems to be in the sitting posture. The



technique of adenoidectomy also is described with the child sitting upright on the lap of the assistant. Very little reference indeed is made to the work of British or American surgeons and there are thereby certain important omissions. In the surgical treatment of facial paralysis the only reference to Ducl and Ballance's operation of nerve transplant is a note by the translator, G. M. Coates. Again in connection with the treatment of cervical rib, while excision of the cervical rib is carefully described, no reference is made to Adson's operation of anterior scalenotomy.

These, however, are comparatively minor criticisms and the book is to be recommended to the specialist and the general surgeon alike, who will find in it much of interest. There are very few errors and all concerned may be congratulated on the production of such a fine work.

F. A. B. S.

**THE HAIR AND SCALP: A CLINICAL STUDY (WITH A CHAPTER ON HIRSUTIES).**—By A. Savill, M.A., M.D. (Glas.), M.R.C.P.I. Second Edition. 1937. Edward Arnold and Company, London. Pp. viii plus 309. Illustrated. Price, 12s. 6d.

It is just under two years ago that we reviewed the first edition of this small book and as it has been so quickly exhausted it is clear that the book has been well received.

This was only to be expected for in our previous review we drew attention to the fact that it supplies much information not readily obtainable elsewhere even in large textbooks on dermatology. It is essentially a book for the general practitioner and family physician, because it deals with conditions that are not serious to life or even to general health and hence are not likely to lead the sufferers therefrom to go to the trouble and expense of consulting a specialist, but which are much more likely to be mentioned 'by the way' to the family doctor when he is being consulted on more serious matters. This book provides such information in a readily accessible form.

A great deal of it has been rewritten and a few small new sections added but the total size of the book is only increased by about twenty pages. We note that the promiscuous use of several varieties of type has been repeated in this edition, in our opinion this practice detracts from the appearance and is disquieting to the reader while it does not add to the utility of the book.

The price charged for the book is somewhat high but that does not appear to have affected the rapid exhaustion of the first edition.

**OPERATIVE OBSTETRICS: A GUIDE TO THE DIFFICULTIES AND COMPLICATIONS OF OBSTETRIC PRACTICE.**—By J. M. Munro-Kerr, LL.D., M.D., F.C.O.G. Fourth Edition with the assistance of D. McIntyre, M.D., F.C.O.G., etc., and D. F. Anderson, M.D. 1937. Baillière, Tindall and Cox, London. Pp. xii plus 847, with 338 illustrations in the text. Price, 45s.

THE fourth edition of Professor Munro-Kerr's famous book has made its appearance under a changed title, i.e., 'Operative Obstetrics' instead of 'Operative Midwifery'. In itself the change of name signifies little, but this edition provides the student with a volume which is almost a different work from the previous editions of Munro-Kerr's book. The form and arrangement remain the same, but so much is being added to our knowledge almost every day, especially of recent years, that the work has been practically rewritten in its entirety.

'Operative Obstetrics' cannot be described as a textbook on midwifery, and indeed, good as it is, it never set out to be a textbook. It deals not with the theory of obstetrics, but essentially with the practice of this science.

In a work of this nature which is excellent throughout, it is difficult to single out certain passages

for special mention. It is noteworthy however that the author does not recommend the use of ergometrine, ernutin, and other derivatives of ergot, but puts his faith in the original liquid extract which must be freshly made. This we agree with and venture to state that one of the reasons why the liquid extract got a bad name in certain quarters is because it was stale when used.

Great stress is placed on two procedures, simple enough in themselves, but, alas, only too often not sufficiently emphasized in teaching. They are the making sure that the anterior shoulder of the child has been brought sufficiently to the front before endeavouring to rotate the head from the occipito-posterior to the occipito-anterior position. The other is ironing of the vagina.

The chapters on the application of the forceps and birth injuries are full of good advice, and there is an excellent chapter on pelvic radiology. Tribute is paid to all the great masters of obstetrics, both past and present, and especially to Smellie, the greatest of all.

**MANUAL OF COSMETICS.**—By C. Lázár, M.D. 1937. Henry Kimpton, London. Pp. xii plus 318, with 12 illustrations. Price, 12s. 6d.

THE title of this book is misleading for the word 'cosmetics' is used in a much wider sense than in ordinary English. This is probably explained by the fact that it is translated from the Hungarian. The book really is an account of all the methods that may be used in dealing with unsightly and disfiguring skin conditions so that surgery, electrotherapy and radiant treatment in all their forms are included in the meaning of the word.

The translation has not been particularly well done nor is the subject-matter well arranged and there is a good deal of ambiguity and loose reasoning displayed in some of the statements. For example, we are informed that one form of baldness is caused by excessive seborrhœic secretion but that the negro who is the most seborrhœic of men never suffers from this type of baldness. Then it is categorically stated that baldness of this type is much commoner now than it was twenty years ago, and this is explained by the 'continuous excitement and hard struggle for a living in the war and post-war years...'. Of course this may be right but one would have liked to see some definite proof that it is so and also that excitement, etc., are causes of permanent increase in activity of the sebaceous glands.

Most of the information the book contains will be found in any good textbook on skin diseases, and in any case it deals with such a small branch of dermatology that it will be little if any use to the general practitioner nor is it likely to be of much assistance to the skilled dermatologist.

P. A. M.

**THE DIABETIC A. B. C.: A PRACTICAL BOOK FOR PATIENTS AND NURSES.**—By R. D. Lawrence, M.A., M.D., F.R.C.P. (Lond.). Fifth Edition. 1937. H. K. Lewis and Company, Limited, London. Pp. vii plus 63. Price, 3s. 6d.

LITTLE comment is necessary on the fifth edition of Dr. Lawrence's practical book for patients and nurses, the predecessor of which we had the pleasure of reviewing a little over a year ago.

No changes appear to have been made in the present edition except that two or three pages have been added on the new slow-acting insulin compounds, the protamine insulins. The author has very rightly remarked that the change to the new treatment must be closely supervised by a doctor to obtain full benefits and to avoid dangers.

We hope the book will continue to be as useful and popular as its predecessor.

J. P. B.

**THE SCIENTIFIC BASIS OF PHYSICAL EDUCATION.**—By F. W. W. Griffin, M.A., M.D., B.Ch. 1937. Oxford University Press, London: Humphrey Milford. Pp. viii plus 203. Illustrated. Price, 7s. 6d. Obtainable from Oxford University Press, Bombay and Calcutta

This is a small and simply written book published at a very reasonable price, so it should have a wide appeal both to the medical profession and physical instructors. The simplicity of the language will make it useful to any physical instructor of average educational attainments.

As well as providing a certain amount of new information on the subject the book is largely in the form of a review of former work to which a full bibliography is supplied, so will also be of considerable value as a book of reference to the subject of physical education and training.

**MEDICAL STATE BOARD EXAMINATIONS—TOPICAL SUMMARIES AND ANSWERS—AN ORGANIZED REVIEW OF ACTUAL QUESTIONS GIVEN IN MEDICAL LICENSING EXAMINATIONS THROUGHOUT THE UNITED STATES.**—By H. Rypins, A.B., M.D., F.A.C.P. Third Edition. 1937. J. B. Lippincott Company, Philadelphia and London. Pp. xviii plus 448. Price, 21s. Obtainable from Messrs. Butterworth and Company (India), Limited, Calcutta. Price, Rs. 15-12-0

This is a book of very little value outside the State of New York in particular and America in general, because such a book is necessarily based on a special curriculum of study.

It may serve a useful purpose in other parts of the world as a guide for the preparation of a similar exam book for the questions set by the local examining body.

**MEDICAL RESEARCH COUNCIL. SPECIAL REPORT SERIES, NO. 222. THE DEVELOPMENT OF CARDIAC ENLARGEMENT IN DISEASE OF THE HEART: A RADIOLOGICAL STUDY.**—By J. H. Palmer. 1937. Published by His Majesty's Stationery Office, London. Pp. 49. Illustrated. Price, 1s.

The shape and size of the heart as determined by x-ray examination have been studied by many workers in different countries, almost from the introduction of radiography, and the chief diagnostic x-ray findings in various forms of heart disease are now well known. Nevertheless, much has remained to be done, especially in investigating the rate at which enlargement of the heart occurs and in correlating changes of size with other clinical events. Whereas most observations have been directed to ascertaining the size and shape of the heart at a particular time, it is clear that a full understanding of cardiac enlargement demands knowledge of the conditions which produce the change and of the rate at which they act. Such knowledge would not only enable the mechanism of enlargement to be better understood, but it would also provide the physician with an improved basis for diagnosis and prognosis.

The studies needed to yield this knowledge are laborious, entailing repeated x-ray examinations of the heart over periods of years by some constant and reliable method, in various series of observations, close clinical observation. The amount of observational work required is great, because it is necessary to deal with homogeneous groups of cases each of sufficient size, and the number of groups which can be chosen is considerable.

While the present report is not claimed to be fully comprehensive, the types of case studied have been well chosen to explore the ultimate effects upon the heart's size of such major events as persistently increased heart-rate, high blood-pressure, congestive failure, and coronary thrombosis. Dr. Palmer's study gives a useful lead to other workers in this field, and his grouped descriptions of cases should have permanent value in providing for reference direct examples and clear details

of changes of the heart's size in many different types of patient.

**MEDICAL RESEARCH COUNCIL. SPECIAL REPORT SERIES, NO. 224. AN ANALYSIS OF THE RESULTS OF TREATMENT OF EARLY, LATENT, AND MUCO-CUTANEOUS TERTIARY SYPHILIS.**—By W. R. Snodgrass and R. J. Peters. 1937. Published by His Majesty's Stationery Office, London. Pp. 126. Price, 2s.

In spite of the great advances in treatment initiated by Ehrlich in 1910, when he discovered salvarsan as a specific remedy, syphilis must still be regarded as one of the major killing and disabling diseases. It is true that it is not the scourge in Britain that it appears to be in the United States of America, where it is reported that there are about 681,000 new cases annually; but during 1935, as many as 19,335 new cases of syphilis were dealt with at treatment centres in England and Wales, and this figure is not significantly less than the 22,010 new cases received at such centres in 1924.

The present study relates to cases treated by Dr. Snodgrass and Dr. Peters at the Western Infirmary, Glasgow, between 1919 and 1932. By following up over this long period cases of syphilis which had received a standard course of treatment, and of which the diagnosis had depended on constant methods, it was possible to see in their proper perspective the conditions which allowed the maximum amount of success and those which were followed by comparative failure. The duration of the inquiry and its uniformity of control are thought to justify its inclusion in this series.

There seems but little doubt that, dealt with in the early stages, syphilis is a disease which is eminently curable if the patient has the will and the opportunity to obtain proper treatment. In the present series of 570 cases of early syphilis, clinical relapse occurred only in 4.39 per cent, and in the great majority of these relapses satisfactory end results were obtained by further treatment. As regards chronic syphilis, the authors are able to say that it cannot with certainty be cured, and that any given individual so affected ought to undergo life-long observation. This report indeed demonstrates once more that, with the present curative methods at our disposal, neither the spread of infection among the population, nor the incidence of the post-syphilitic manifestations among those infected, will be eliminated or controlled until it is generally recognized that adequate initial treatment is the dominant factor in the situation. Public authorities must persuade those infected with syphilis to subject themselves to treatment in the early stages, and the treatment must be of the best type known.

## Abstracts from Reports

### ANNUAL REPORT ON THE WORKING OF THE CIVIL HOSPITALS AND DISPENSARIES IN THE PROVINCE OF ASSAM FOR THE YEAR 1936

WITH BRIEF EXPLANATORY NOTES

THERE were 268 hospitals and dispensaries of all classes at the commencement of the year and 274 in working order at the close of the year. Six new dispensaries were opened during the year, of which two were state dispensaries (one state-public at Bajengdoba and one state-special at Pengin), three local fund and one railway institutions.

The total number of in- and out-patients treated at the state-public, local fund and private-aided hospitals and dispensaries rose from 2,124,973 in 1934 to 2,270,621 in 1935, but fell to 2,185,317 in 1936, i.e., a decrease of 85,304 on the previous year's figure. The district of Sylhet, Nowgong, Kamrup, Manipur and Goalpara show a decrease of 58,906, 31,014, 23,320, 8,766 and 5,357, respectively. The decline in attendance is attributed to

the healthiness of the localities and to the less prevalence of malaria during the year.

The highest increases were recorded in the districts of Sibsagar (14,538), Naga Hills (10,453), Lakhimpur (6,213), Lushai Hills (5,308), and Khasi and Jaintia Hills (4,901). The increase in the number of patients in the Sibsagar district was mainly due to the high incidence of malaria in the rural areas and in the other four districts the increases occurred under diarrhoea, ulcerative inflammation and other diseases of the skin, nails, excluding tumours. There was also a higher incidence of malaria in the Khasi and Jaintia Hills and Lakhimpur.

**Cholera.**—One thousand two hundred and ninety-nine patients were treated in 1936, against two thousand and three hundred and eighty-five in 1935. Of these Sylhet furnished 940, Cachar 112, Sibsagar 108 and Kamrup 54.

No cases were reported by the Naga Hills, Lushai Hills, Lakhimpur, Garo Hills, Sadiya Frontier Tract and Balipara Frontier Tract.

**Malaria.**—In all 663,638 cases were treated with 133 deaths, against 766,896 and 116, respectively, in the year preceding.

The disease was prevalent as usual throughout the province. The increase occurred during the year under report in the districts of Sibsagar (45,212), Lakhimpur (26,222), Khasi and Jaintia Hills (20,480), Garo Hills (17,030), Sadiya Frontier Tract (9,143) and Manipur (5,386).

**Dysentery.**—The total number of patients treated was 45,184, with 147 deaths, against 48,929 and 96, respectively, in 1935. The highest figures are shown by Sylhet (14,018), Goalpara (7,909), Kamrup (4,514) and Sibsagar (3,419).

**Kala-azar.**—There were 5,327 cases and 50 deaths, against 5,476 and 52 deaths in 1935.

The following figures for the last 8 years show the number of cases treated in hospitals and dispensaries other than those directly under the public-health department:—

1929	..	..	..	..	6,166
1930	..	..	..	..	4,308
1931	..	..	..	..	3,755
1932	..	..	..	..	3,696
1933	..	..	..	..	4,443
1934	..	..	..	..	5,558
1935	..	..	..	..	5,476
1936	..	..	..	..	5,327

Altogether there was a slight decrease in the figure for 1936 when compared with those for 1934 and 1935, the warning against the increase in the number of kala-azar cases in the province as given in the report for 1933 still holds good and the campaign against kala-azar should not be relaxed in any way.

**Leprosy.**—Eight hundred and forty-six cases were treated by hospitals and dispensaries, against 778 in 1935. This however does not give a correct picture of the cases treated in the province. Particulars of the working of leper asylums and other clinics show that 4,718 cases came under treatment during the year, against 4,926 in 1935.

**Tuberculosis of lungs.**—There were 1,843 cases with 92 deaths, against 1,641 cases with 104 deaths in the previous year. This disease is very prevalent throughout the province. The highest figures are shown by Kamrup (416), Sylhet (346), and Goalpara (257).

**Other forms of tuberculosis.**—Three hundred and twelve patients were treated in 1936, against 337 in 1935.

**Smallpox.**—The figures rose from 40 with 1 death to 67 with 3 deaths in 1936.

**Influenza.**—The figures fell from 34,365 with 3 deaths to 33,239 with 7 deaths in 1936.

Cases of beri-beri [? epidemic dropsy] fell from 139 in 1935 to 90 in the year under report. The highest incidence (54) occurred in the district of Sylhet, against 100 in the previous year.

There were 2,600 cases of pneumonia with 152 deaths against 2,350 with 150 deaths in 1935. No cases of plague were reported during the year.

The figures under enteric fever rose from 881 in 1935 to 1,053 in 1936.

**Anti-rabic treatment.**—

The total number of patients treated in the hospitals and dispensaries of the province was 1,535, against 1,315 in the previous year.

No new centres were opened during the year.

**Yaws.**—The campaign against yaws was continued during the year. One thousand eight hundred and forty cases were treated in civil hospitals and dispensaries, against 1,738 in 1935, while 1,656 cases were treated by the public-health staff in charge of dispensaries under the department.

**Indian Red Cross Society.**—Though Assam is a backward and poor province Red Cross work appears to be progressing very satisfactorily, as will be evident from the fact that it has occupied the second position in India so far as the enrolment of members during 1936 is concerned.

**Summary of activities:**—

**Maternity and child-welfare centre.**—The number of welfare centres remained at five, as in the previous year. The work of the *dhai* training classes at Silchar, Karimganj and Sylhet was satisfactory. Suitable candidates for training as health visitors are still very few among the better class Bengali and Assamese families.

A large number of grants for maternity and child-welfare work throughout the province have been made from the Silver Jubilee fund.

A Junior Red Cross training camp was held at Shillong on the 20th, 21st and 22nd November, 1936, at the Lady Kerr Child-Welfare Centre. Miss Norah Hill, A. R. R. C., the Organizing Secretary, Indian Red Cross Society, attended the camp and delivered lectures with demonstrations.

**The Assam Medical Research Society.**—Government continued to give a grant of Rs. 25,000 to the Assam Medical Research Society. The activities of the society were chiefly confined to malaria, cholera and dysentery.

## REPORT OF THE EUROPEAN MENTAL HOSPITAL AT RANCHI FOR THE YEAR 1936

DURING the period under review, the hospital continued to serve Assam, Bihar, Bengal, British Baluchistan, the Central Provinces, the North-West Frontier Province, Orissa, the Punjab and the United Provinces. European mental patients from the French Settlement of Chandernagore are now eligible for admission into this hospital, but no such patients were actually admitted from that area during the period under report.

The number of patients resident in the hospital at the beginning of the year was 215 (101 males and 114 females) against 196 (91 males and 105 females) in the preceding year. The maximum number resident in the hospital on any one night was 226 (105 males and 121 females) against 220 (104 males and 116 females) in the previous year. The total admissions during the year under review were 51 (22 males and 29 females) against 58 (26 males and 32 females) in the previous year. Of these, 12 (4 males and 8 females) were re-admissions against 15 (6 males and 9 females) in the previous year.

**Health of patients.**—There has been a decrease in the daily average number of sick treated in the hospital during the year under report when it was 4.00 (2.30 males and 1.70 females) as compared with 5.02 (3.08 males and 1.94 females) in the previous year.

The important admissions were for malaria (24), colitis (3), influenza (6), epilepsy (3) and abscess (9).

As heretofore, malaria has been responsible for a large number of cases of sickness. All these cases were treated with quinine hydrochloride injection followed by cinchona mixture for a month, their blood being examined from time to time.

Valuable as systematic psychiatry has proved in the past in establishing a superficial order in the psychoses (a pathological foundation is not yet available) and, in promoting research, it is to a psychiatry of the

individual that we now turn in the hope of effective treatment. Classification which constituted so great a part of institutional psychiatry has been superseded by aetiology, environment and psychobiology.

The appositeness of this view is realized when we consider the influence of one adverse environmental factor—malnutrition, the effects of which are at the present moment being amply demonstrated. In common with other countries, India is experiencing the effects of the economic crisis. The psychiatric repercussions of malnutrition have been demonstrated by Lush, Holt, Levine, Blanton, Laird, and others in the correlation between under-nourishment and intellectual deterioration, lack of energy, impaired concentration and poor memory associated with either irritability and over-excitability or listlessness and apathy. The constitutionally enfeebled are unable to call upon a sufficient reserve; enhanced competition, malnutrition and psychopathic breakdown form a vicious circle.

The immediate results of treatment are very gratifying; a tonic, a sedative, good food, encouragement, a simple trade in the occupational therapy department, are all that is required. Prognosis is unfavourable; the removal of protection and the violence of open competition will result in failure and recertification. Recent research would suggest, also, that these symptomatic manifestations of malnutrition descend through the first generation to appear with the more profound effect in the second and that the genotype may be altered and injured for several successive generations.

Finally we repeat our annual plea for the early treatment of mental diseases. Often the fear of the social stigma must be considered as a factor in preventing many from seeking earlier advice, but the delay may be due to sincere doubt. The commencing insidious changes of character can become further complicated by appearing in adolescence when moods and waywardness and emotional crises are normally to be expected. It is the step into the abnormal—the commencing apathy, loss of ambition, fine deterioration in moral character, disinterestedness, or excessive emotional tone which must be recognized, though how far these reticences, enthusiasms and depressions are pathological and how far physiological may occasion a decision of grave and profound difficulty to the physician. Yet it is necessary to reach the sick mind at this early stage to prevent the daydreams from crystallizing into delusions and the moodiness and reticence hardening into apathy and withdrawal.

*Treatment of mental conditions.*—Particular care was given during the year to the following methods of treatment:—

(1) *Occupational therapy.*—Each patient in the occupational therapy department is treated as an individual; his interests are investigated, his abilities tested, and his potentialities considered. The widely varied crafts enable his talents to be harmoniously utilized. It is not helpful to force carpentry or painting on a patient whose emotional energy would be more smoothly sublimated through music.

This important form of treatment has continued to maintain its steady influence as a therapeutic and curative agent, producing contentment, diminishing excitement and inducing a general improvement, both physically and mentally, in patients. All the patients discharged from this hospital as recovered and improved during the year have undergone occupational therapy treatment. The interest evinced by them in their respective occupations is very encouraging. The percentage of attendance in the occupational therapy classes (including music and physical culture classes) has increased during the year under report as compared with the previous year. A number of patients occupy themselves voluntarily even out of the occupational therapy hours; and the dejection and deterioration during holidays are definite.

A great advantage which has been achieved is a more thorough training in some of the occupations; patients when discharged from the hospital are thus able to utilize this simple knowledge to their benefit as in many

cases the nature of their disease precludes any return to an occupation involving mental stress.

*Physical culture.*—During the year, the patients took a keen interest in physical exercises. All patients who were physically fit attended regularly the classes held at 7 a.m. every day in the well-equipped gymnasium of the hospital. Patients of both sexes attend the morning drill classes for half an hour after which they are taken in batches to the gymnasium. The male patients are taught parallel bar exercises, Indian club swinging, Roman rings, climbing ladders and ropes, boxing, fencing, weight lifting, and other forms of suitable exercises. The female patients are taken in skipping, rowing and other forms of freehand exercises. A few gymnastic exhibitions were staged with excellent effect. These exhibitions were attended by the public who displayed much appreciation of the performances. In hot weather, selected patients were, as usual, taken out once a week for swimming and rowing in the lake of the government agricultural farm.

*Amusements.*—The organization of congenial amusements is another valuable feature in the treatment of mental patients. With this view, attempts have been made throughout the year to provide for patients as many and as varied amusements as possible.

The principal items were the following:—

*Band.*—The band continued to provide the patients with a source of very great pleasure so that the expenditure for it is thoroughly justified. Seventy-five per cent of the patients resident in the hospital attended the concerts and dance socials every week. During the hot weather there were moonlight promenade concerts on Thursday evenings on a spacious lawn.

*Music.*—Dancing and singing.—The music mistress continued to supervise the community singing, piano practice, and dancing classes for patients who showed either a talent or an inclination for such. Some of the patients were given individual attention in singing and dancing in the afternoons. Two variety concerts were staged by the patients and staff of this hospital with great success. On the 1st May there was a Maypole dance on the lawn outside the hospital. The patients who took part in it were dressed in country costumes and the spectacle was greatly appreciated by the public. On the 24th December carol singing was organized with a batch of selected patients. The patients greatly appreciated this. The usual fancy dress dance for the patients was held on the 30th December and several patients won prizes for their proficiency in dancing and originality in dress.

*Sports and games.*—The outdoor and indoor games were kept up to a high standard throughout the year. As in the previous years, sports were held during Christmas and proved a great success. About 40 per cent of the total number of patients resident in the hospital participated in them. Patients who stood first, second and third in each event were presented with prizes. On New Year's day also there were sports in which a large number of patients took part voluntarily. During the appropriate seasons, all able-bodied patients were encouraged by the staff to attend, for an hour every evening, outdoor games, such as tennis, football, hockey, cricket, badminton, basket-ball, and indoor games, viz, carrom, table-tennis, cards, chess, draughts, bagatelle. During the year, nine cricket matches were played against the local teams and eight of them were won by the home team. During the football season, several tournament matches were played by the hospital teams against various teams of the Ranchi district. Selected patients of both sexes were daily taken out for rides on cycles. In short, strenuous endeavours were made by the staff throughout the year to obtain the full therapeutic value out of sports and games of every description.

*Picnics.*—During the fine weather patients were taken out occasionally for picnics which they enjoyed very much.

*Special methods of treatment.*—It has been possible to try out several of the latest pharmacological preparations in the treatment of the major and minor psychoses

(in certain cases acknowledgment is due to the gratuitous co-operation of Calcutta druggists).

A synopsis of special treatment is given below; this does not include routine tonics, temporary sedatives, etc.—

**Hydrotherapy.**—During the year, 18 cases were treated by hydrotherapy. Of these, one recovered and was discharged, ten improved, one slightly improved and no improvement was noticed in the remaining six cases.

**Sulfosin treatment.**—Thirty-five patients were treated with sulfosin injections. Of these, 5 recovered and were discharged, 10 improved and the remaining 19 cases showed no improvement.

**Pyriser vaccine therapy.**—Four cases were subjected to this treatment. Of these three cases improved and in one case no improvement was noticed.

**Sodium amytal (capsule) orally.**—Two patients were treated by sodium amytal orally. Slight improvement was noticed in both of them.

**Narco-analysis with evipan-sodium.**—This treatment was given to five patients (2 males and 3 females). Of them, 2 female patients recovered and were discharged from the hospital and the remaining 3 (2 males and 1 female) showed improvement.

**Glandular treatment.**—Five cases (2 males and 3 females) were treated by thyroid and orchitic substances, but no improvement was noticed in any of them.

**Somnifene.**—This was used for the induction of prolonged sleep in three female patients. Three of them were slightly improved and one showed no improvement.

**Tryparsamide.**—Two cases of general paralysis of the insane were treated with tryparsamide, but no improvement was noticed in them.

**Salvarsanized serum injections.**—Two patients were treated with salvarsanized serum injections (intraspinally) but without appreciable improvement.

#### ANNUAL REPORT OF THE MALARIA ADVISORY BOARD, FEDERATED MALAY STATES, FOR THE YEAR 1936. BY A. NEAVE KINGSBURY, CHAIRMAN

This report does not permit of abstraction but it should be read by all medical officers of health who have to deal with malaria control, because it contains the summarized reports on the work of experts in all branches of the subject.

#### ANNUAL PUBLIC HEALTH REPORT OF THE PROVINCE OF BIHAR AND ORISSA FOR THE YEAR 1935. BY LIEUT.-COL. S. L. MITRA, D.P.H., I.M.S., OFFICIATING DIRECTOR OF PUBLIC HEALTH

**Population.**—The estimated population for the year under review was 39,146,788 as against 38,779,485 of the previous year.

The total number of births in this province during 1935 was 1,305,580 as compared with 1,268,330 in 1934. This means an increase of 37,250 births or 1.0 per thousand population during the year, over those recorded in the preceding year.

**Deaths.**—The total number of deaths in the province was 947,051 as compared to 981,599 in the previous year. Out of these the rural areas recorded 925,303 deaths and the urban areas 21,748. This means a decrease of 34,548 deaths or 0.9 per mille of population over those recorded in the preceding year. Provincial death rate for 1935 was 25.1 as compared with 26.0 in 1934 and 22.1 in 1933. The average death rate for the last ten years was 23.6.

The rate of increase in the population, i.e., the excess of birth rate over the death rate in the province, was 9.5 as compared with 7.7 in the previous year.

The decrease in the number of deaths was chiefly due to a comparatively less number of deaths from smallpox, plague and fevers under which death rates of 0.6, 0.08 and 17.6 were reported as against 0.8, 0.1 and 17.8.

The urban death rates for cholera, smallpox and fevers were lower than those of the rural areas. This

is ascribed to better standard of sanitation in the municipal towns, but the mortality rate from the respiratory diseases still remains higher in the urban areas. The incidence of pulmonary tuberculosis is reported to be increasing in many of the bigger towns. This disease together with influenza and pneumonia appears to be mainly responsible for the increased mortality rate from respiratory diseases. Control of tuberculosis particularly in bigger towns is necessary.

**Cholera.**—The death rate from cholera rose from 1.5 per mille in 1934 to 1.7 per mille in 1935. The total number of deaths from this disease in 1935 was 61,876 as compared with 57,289 in 1934.

**Cholera preventive measures.**—Twelve district boards continued to maintain health officers with a suitable subordinate health staff. Forty-six Government epidemic doctors were detailed on epidemic duty during the year in the cholera affected areas of the districts. Stocks of disinfectants and also kaolin for use in the treatment of cholera cases are kept in reserve by the district boards. Anti-cholera inoculation has now become a popular preventive measure and Government maintain a large stock of cholera vaccine at the Vaccine Depot, Namkum. The Superintendent, Vaccine Depot, is generally asked by telegram to despatch the vaccine immediately wherever it is required in the province. Choleraphage was also used for the prevention and treatment of the disease.

**Smallpox.**—The total number of deaths from smallpox during 1935 was 22,067 as compared with 30,310 in 1934. The mortality rate for the year 1935 was 0.6 as against 0.8 in the previous year. As usual the rural areas suffered more than the urban areas.

The vaccine lymph manufactured at the Vaccine Depot, Namkum, is supplied throughout the province free of cost. Although it is a known fact that vaccination definitely checks the incidence of smallpox, the rate of mortality from the disease tends to show sharp rises at times. This is due to the fact that a large number of children escape even primary vaccination and thus remain unprotected. Besides, the immunity conferred by primary vaccination passes off within six to seven years. It is, therefore, quite clear that so long as vaccination and also re-vaccination are not made compulsory throughout the province, the incidence of smallpox will continue.

**Plague.**—There were 2,861 deaths from plague in the province during the year under report as compared with 5,411 in the previous year, and the death rate was 0.08 as compared with 0.1 in the previous year.

Government epidemic doctors were detailed on plague duty. Anti-plague inoculations were performed. Besides the usual measures of rat destruction, evacuation and disinfection of floors and lower portion of the walls of the infected houses with kerosene oil emulsion were also carried out.

**Dysentery and diarrhoea.**—There were 19,956 deaths from this group of diseases as against 23,481 deaths in the preceding year and the mortality rate was 0.5 as against 0.6 in the previous year.

The highest death rate in the districts of Orissa from these diseases is probably due to the climatic conditions and to a large extent is associated with the bad state of water-supply and defective sanitation in these districts. The major portion of the town of Puri received piped water-supply in October 1935 and it is expected that improvement in the water-supply will result in a decrease of the incidence of these diseases in that town.

**Fairs and festivals.**—The towns of Puri, Gaya and Deoghar being sacred places of Hindu pilgrimage attract large numbers of pilgrims every year from all over India.

The Snan and Rathjatra festivals were held in Puri on the 16th June and 2nd July, 1935. Sixty thousand pilgrims, besides the normal population of Puri numbering 37,558, assembled to participate in the celebration of the car festival. Nine sub-assistant surgeons were detailed by Government. Five of these were deputed on sanitary duties and four were put on special duty at



the cholera hospital. Besides these, two more sub-assistant surgeons were employed by the Puri municipality for the occasion. The town was, as usual, divided into six sanitary wards and each ward was put under the charge of a medical officer. The pilgrims stayed in 14 dharamsalas and 116 lodging houses which are licensed under the Places of Pilgrimage Act. All the wells were regularly treated with cholera-phage during this *mela* period.

The Puri waterworks was practically completed just before the *mela* started. On the 14th June, 1935, a few standposts were ready and the people got the supply from piped water for the first time in the town of Puri.

In view of the very encouraging results obtained by the use of cholera-phage in recent years in the province, cholera-phage was mainly used both as a curative and prophylactic measure and the operation of anti-cholera inoculation was restricted mostly to the permanent inhabitants of the town and to those pilgrims who particularly desired to be inoculated.

The Sonapur fair, the biggest fair in India, started on the 6th November this year and lasted for a fortnight. About three lakhs of people visited the place during the *mela* period. Special sanitary arrangements as in the previous years were made by the Public Health Department in conjunction with the district board health staff. The whole *mela* area was as usual divided into three health circles and each circle was placed in charge of a medical officer of health deputed by the Public Health Department. All the 65 wells in the *mela* area were cleaned and chlorinated before the commencement of the fair and they were regularly chlorinated during the *mela* period. The drinking-water supply was through the deep tube-wells fitted with pumps and overhead tanks from which it was distributed by means of pipes and standposts throughout the *mela* area as was done in the previous year. Nine cases of cholera were reported from the *mela* area. They were all admitted into the isolation hospital for treatment; out of these three died. Prompt measures were taken to disinfect the stools and vomited matter of the cholera cases. The contacts of these cases were all traced and cholera-phage was administered as a prophylactic measure.

The Pitripaksh *mela* at Gaya commenced on the 12th September and ended on the 27th September, 1935. Sixty-seven thousand four hundred and forty-two pilgrims visited Gaya during the period as compared with 61,000 in the last year. The sanitary arrangements were made on the same lines as in the previous year. The whole of the *mela* area received piped-water supply from 4 a.m. to 9 p.m. every day during the *mela* period. One case of cholera occurred in a lodging house. The case was promptly removed to the cholera hospital where the patient was successfully treated. The lodging house was thoroughly disinfected and all the contact cases were given cholera-phage as a preventive measure. The disease did not spread.

There has been a steady decrease in the number of pilgrims visiting Deogarh during the last four years.

**Malaria.**—Fever appears to be the chief cause of mortality in the province. Sixty-six thousand nine hundred and sixty-four deaths from fever or 67.6 per cent of the total mortality from all causes were reported to have occurred during the year. A number of diseases in which the rise of temperature is a marked symptom continues to be grouped under the general heading 'fever'. It is, therefore, clear that malaria alone could not have been the only cause of this large number of deaths although the disease undoubtedly accounts directly or indirectly for the bulk of these deaths.

**Sale of quinine.**—Sale of quinine in the various post offices in the province has been in force for many years. The amount purchased annually cannot be regarded as satisfactory.

**Spleen census.**—Eleven thousand two hundred and forty-seven children collected from 771 villages were examined. Out of these 1,448 children were found to be suffering from enlargement of spleen and these came from 342 villages.

**Infant mortality.**—The rate of infant mortality decreased from 149.95 per thousand in the previous year to 129.2 per thousand during the year under review. The maternity and child-welfare work continued to be satisfactory and the maternity centres rendered useful aid to the public. Some municipalities maintain a midwifery service for their own areas and it is gratifying to note that some of the district boards have realized the importance of the need for training indigenous *dais* and have launched on schemes for the purpose, though on a moderate scale. Attempts were made to hold baby shows and organize propaganda on maternity and child welfare at *melas* and exhibitions held in the various urban and rural areas of the province.

**Epidemic dropsy.**—Dropsy in epidemic form broke out in the town of Purulia and the sadar subdivision of the district of Manbhum. Seven hundred and eighty-two persons died in the affected areas. Government and district board epidemic doctors were specially deputed to carry out house to house treatment in the affected villages. The Calcutta School of Tropical Medicine also sent out a field unit to investigate the pathogenesis of the disease.

**School medical inspection.**—Out of 11,166 boys and 550 girls examined as many as 6,212 boys and 427 girls were found to be defective or diseased. The majority of the boys had minor troubles, but major defects of eye and heart were also noticed, besides a few cases of pulmonary tuberculosis. As usual the parents or guardians of boys were informed of the particular defects the boys were suffering from and suggestions were made for their proper treatment.

#### REPORT OF THE THIRD UNITED PROVINCES MEDICAL CONFERENCE HELD AT ALLAHABAD ON THE 29TH AND 30TH OCTOBER, 1936

THE Third United Provinces Medical Conference was held on the 29th and 30th October, 1936, in the Kayasth Pathshala buildings, Allahabad. There was a fair attendance of representatives of the medical profession from all over the United Provinces. The Reception Committee, of which Major D. R. Ranjit Singh was the Chairman, made excellent arrangements for board and lodging of delegates in the Royal Hotel, Allahabad, free of charge and no pains were spared to make the guests feel at home.

Messrs. King and Company of Allahabad entertained the guests at a tea party on the evening of 29th October, 1936, in the Kayasth Pathshala lawns. The Reception Committee gave a grand banquet at the Royal Hotel which was joined by about 100 members. The Bengal Chemical and Pharmaceutical Company, The Lily Biscuit Company and Polson's Butter Company combined and entertained the members of the conference to a morning breakfast. Messrs. Gray and Company of Allahabad entertained the members to a lunch in their compound on 30th October, 1936.

Some of the members were shown round the Deaf and Dumb Institute which was very instructive.

The Scientific Section was also a great success and some very good papers were read and discussed on its two sittings on 29th and 30th October, 1936.

An exhibition was also arranged in the Kayasth Pathshala buildings where many firms exhibited their products.

This is the third year in the life of the United Provinces Medical Association. Two years are far too short a period of existence to permit of an accurate survey of the value of the work thus far accomplished.

The president-elect, Captain S. K. Chowdhry, appealed to all qualified men and women to come forward as members of the Indian Medical Association or one of its branches.

Finally various resolutions as recommended by the Subject Committee were placed before the open session for its consideration and carried unanimously.



**QUARTERLY REPORT OF THE MYSORE STATE  
DEPARTMENT OF HEALTH, OCTOBER TO  
DECEMBER 1936. BY P. PARTHASARATHY,  
L.M.S., B.S.C., L.R.C.P., L.R.C.S., D.P.H., D.T.M.,  
DIRECTOR OF HEALTH**

**GENERAL**

The state of public health in the quarter under report was satisfactory, except for the fact that cholera assumed epidemic proportions in a few *taluks*. Small-pox and plague were practically absent. In view of the fact that cholera had been forecasted months before and all possible precautionary measures were taken in advance the epidemic has been kept under control.

**POPULATION**

The estimated populations of the districts and cities as on 1st July, 1936, were 6,725,754.

**PARTURITION STATISTICS**

During the quarter 2,950 labour cases were conducted in the 31 maternity hospitals and female dispensaries. The number of maternal deaths that occurred among these cases was 53 giving a maternity mortality of 17.96 per 1,000 births, as compared with 15.08 in the previous quarter.

**VITAL STATISTICS REPORTED FOR THE PREVIOUS QUARTER  
(JULY TO SEPTEMBER 1936)**

**Births.**—In the quarter under report, a total of 34,686 births were reported (exclusive of still-births). The birth rate computed for the quarter was 20.63 per mille of population, as compared with 17.76 in the previous quarter.

**Still-births.**—During the quarter 547 still-births were reported against 495 in the previous quarter.

**Deaths.**—The number of deaths (exclusive of still-births) reported during the quarter was 22,581 giving a death rate of 13.43, as compared with 12.71 in the previous quarter.

**Maternal mortality.**—During the quarter 546 deaths of mothers at childbirth were reported as compared with 516 in the preceding quarter. The computed rate of maternal mortality based on the total births inclusive of still-births during the quarter was 15.50 per 1,000 births as against 17.99 in previous quarter.

**Infant mortality.**—The number of deaths of infants under one year of age reported during the quarter was 4,021 giving an infant mortality rate of 115.93 per 1,000 births, as compared with 110.14 in the previous quarter.

**REPORT OF THE CHEMICAL EXAMINER TO  
GOVERNMENT, PUNJAB, FOR THE YEAR 1936**

[We have taken the liberty of reprinting almost completely this lecture by Lieut.-Colonel D. R. Thomas, O.B.E., I.M.S., which appears as an appendix to his annual report for 1936, because it contains many hints that will be of value to medical men called on suddenly to deal with murder.]

**A LECTURE DELIVERED TO SENIOR POLICE OFFICERS AT THE  
PHILLAUR TRAINING SCHOOL ON THE 27TH OF FEBRUARY  
1937**

Police science has received its proper place in the lawful administration of continental countries and the scientific training given to the police force is far in advance of anything given to their brother officers in Great Britain. In France, the detective branch of the police is given a course of lectures in medico-legal subjects as well as practical laboratory work to equip them in their work to detect crime, collect proofs and hand the authors up to justice. Similar instructional courses are given in Germany, Italy and Austria. Great Britain has now started a Police College at Hendon. I visited the place when I was on leave in 1934 and I was very impressed with the syllabus of the teaching and the practical instructions that are being given there to the young policeman. So far it only meets the requirements of the metropolitan area, the provinces have no such teaching institution.

In 1935 an Advisory Committee on the Scientific Investigation of Crime was appointed by the Home Secretary under the chairmanship of Lord Trenchard. Lord Atkin, Lord Dawson, Sir Bernard Spilsbury and others served on the committee. The committee was asked to advise as to the manner in which the Laboratory for the Scientific Investigation of Crime established in the Metropolitan Police College at Hendon might best be developed in the national interest, with special regard to the desirability of its being in close and effective touch on the one hand with other police institutions established in Great Britain or other countries for the like or cognate purposes and on the other hand with any Medico-legal or Scientific Institute that might be constituted for teaching and research work in forensic medicine or other relevant sciences. The committee submitted an interim report which may be summarized as follow:—

(1) That the Metropolitan Police Laboratory was now an integral part of the machinery for the investigation of crime in the metropolitan area.

(2) That the instruction given to the rank and file of the police force in the application of science to the investigation of crime was being appreciated and that its value was being increasingly realized as a part of the crime-fighting machine.

(3) That instruction, post-mortem examinations and research work for police surgeons could best be served by the establishment in London of a separate National Medico-Legal Institute. This then is briefly the position of police science in the Western countries.

Now let me return to India and see what is being done in the way of imparting scientific instructions to the police. Each province has its own chemical examiner's laboratory which works in very close contact with the police. Each province has its own police training school. I am very pleased at having been invited to speak to you at the Phillaur Police Training School to-day. I am also deeply conscious of the efficient training that is being given here to the young policeman before he is drafted out to the district on field work. The finished product which is turned out here is excellent but after a few years it requires polishing. These provincial police training schools must be looked upon as preparatory schools somewhat analogous to the military colleges at Sandhurst and Woolwich. You have no Imperial Police Staff College where the senior men with district experience can go for more advanced instructions. A course of lectures and practical demonstration on the identification of individuals, the sketching of the scene of a crime, photography, stains such as blood, semen, paints, etc., hairs, firearms, and the science of forensic ballistics, explosives and explosions, counterfeit coins, documents, fires and insurance frauds, cocaine smuggling, etc., etc., would make for efficiency in your work and give you confidence when you may be alone in some outlandish district. Police work in this country is tropical. It is often dangerous. The police courses given at Scotland Yard deal with the problems at home; whereas you require instruction in tropical work. I have been intimately associated with you in some of your difficulties and I have the greatest admiration for the way you tackle difficult problems. If for no other reason than this I feel that you are entitled to all the help that science can give you.

**Murder by violence in India.**—This type of murder accounts for about 1,200 cases annually. The comparative percentage is higher in the Frontier Province than it is in the Punjab. The average Punjabi is a hot-tempered individual and acts quickly. He seizes the nearest weapon at hand. It is a pity he does not employ the more noble pugilistic method of attack. His temperament being such, the scene of a murder by violence may be anywhere and is not infrequently out in the fields.

Before proceeding to give you any detailed instructions on how to investigate, I would like you to observe the following golden rules:—

(1) Go at once to the scene of the crime.

(2) Isolate the spot by putting on a guard.

- (3) Examine slowly.
- (4) Be thorough.
- (5) Take a photograph or make a sketch of the place.
- (6) Write notes.
- (7) Consult others.
- (8) Use imagination.
- (9) Avoid complicated theories. Remember you are dealing in most cases with simple-minded folk.

Now proceed to examine the spot carefully, many clues may be present to the observant eye and they will all be of vital importance in the successful prosecution of the case. There may be evidence of a struggle, buttons may be torn off, pieces of garments may be lying about, footprints and finger-prints may be present, hairs may have been pulled out and possibly the actual weapon may have been discarded. The body of the victim may be lying on the ground. Make every effort to have the body identified. Once you know who the victim is then you can trace his friends and possible enemies. I repeat again that you must make every effort to have the body identified. If you cannot identify the body call in a medical man, he may be able to help you from the examination of the body. A cataract present in the victim's eye, a deformed joint, scars on the body, old fractures of the arm or leg, a missing finger or toe, are some of the peculiarities that may assist in the identification of a body.

Then proceed to ask the medical man as to the probable time of death. This information is of importance as it tells you when the murder happened provided the victim died immediately after receiving the wounds.

If the weapon is found then proceed to ask if the wounds on the body could be caused by such an instrument. Please do not rush the medical man, give him time to think out the answers to your questions. He may be young and nervous, such questions are not always easy to answer. Be patient and helpful and do not put to him leading questions. Take him absolutely into your confidence and work out the plot together.

If the weapon is not found, ask his opinion as to the possible cause of death and the probable means by which it happened. You may be told that it was by a sharp instrument, a blunt instrument or that he would prefer to reserve his opinion pending a post-mortem examination. Before you decide to hand the body over for such an examination, inspect the victim's clothes carefully for possible cuts or tears on the clothes caused by a dagger, a sword or any other instrument. The clothes will naturally be blood-stained in such cases. Examine to see if such marks on the clothes correspond with any wounds on the body and if the weapon is found, examine if the cuts or tears on the clothes could be caused by such a weapon. It is the duty of the medical man to see if the actual wounds can be caused by such a weapon. Go through the pockets of the clothes of the victim and make an inventory of everything found. It is not necessary to send the blood-stained clothes for examination when fatal wounds are present.

Then proceed to examine the surrounding area for possible traces of blood, on blades of grass, on the ground, on any adjacent wall or a charpoy. You will realize that a tiny speck of blood about the size of a pin's head is all that is required to identify the origin of the blood.

**How to collect exhibits.**—All exhibits should be carefully handled. They should be collected in one place and a guard put on them. They must not be handed round from one person to another as in this way tiny specks of blood or fine strands of hair become lost. This advice applies to all kinds of exhibits which are to be sent for analysis.

**How to pack exhibits.**—All blood-stained exhibits should be absolutely dry before they are packed. A safe method is to expose them to the sun. Dried blood can be preserved for years, whereas wet blood stains decompose rapidly and become useless for examination. It is for this reason that weapons of offence found weeks afterwards from a canal, or a well or even buried in fairly dry soil, may give the tests for blood. Once the

blood has dried properly on a weapon, it is very resistant to decomposition. Unfortunately, with blood-stained clothes, the fabric itself putrefies and decomposes the dried blood in the same process. Blood found on a blade of grass or on a stone is a better exhibit for examination than blood-stained earth. When blood-stained earth is the only material available, then pare off a little of the surface, say, the size of an ordinary rupee, and pack it carefully in a small box. Do not, as sometimes happens, dig up all the surrounding area and send maunds of powdered earth for examination. It will be almost impossible to find blood in such a bulk. It is like looking for a pin in a hay-stack.

Sharp-edged and sharp-pointed weapons should be packed in wooden boxes. If packed in cloth, the edges or the sharp points invariably cut through the cloth during transit and become exposed, and the exposed parts are the most likely places where blood should be present.

If the alleged murderer is found, take charge of his clothes and search his house carefully. You should examine his body for possible blood stains. If suspicious stains are found on his arms or legs, moisten with clean water a piece of white blotting paper or a small swab of cotton-wool and press it on the stain for a few minutes in the hope of transferring the stains on to the paper or cotton-wool. Dry the paper or cotton-wool in the sun and label the exhibits as 'stains transferred from the body of the accused on to a piece of blotting paper or cotton-wool as the case may be'. It is rather dangerous to scrape stains off living skin in case of bleeding. In any case do not give him a bath and send the bath water for analysis. On no account should you pare off or manicure his nails. Human nails are meant for scratching the body and blood is often present under the nails of normal beings. Human nails, being living tissue, contain blood, therefore blood found under or in human nails has no medico-legal value.

If you cannot get any other proof against the accused beyond clipping his nails then I would advise you to give him up.

I have here two *gandas*, both covered with blood, one illustrating how the exhibit should be despatched for chemical examination and the other showing how it should not be sent. As you know, a *gandasa* is a weapon commonly used by murderers in the Punjab.

The correct one as shown here illustrates:—

- (1) A label, correctly numbered and securely tied on for identification in court.
- (2) There is no writing on the exhibit beyond possibly one signature on a carefully selected spot free from suspected blood stains.
- (3) There are no labels or wrappers containing writing glued on to the actual exhibit.
- (4) There are no seals in various shades of sealing wax ornamenting the *gandasa*.
- (5) All suspicious stains are left as they were actually found. They must not be encircled with ink or pencil marks.

Now let us examine the second *gandasa* where every possible obstacle has been added to prevent the chemical examiner from carrying out his examination. Here you have the wrong way of sending a *gandasa*:—

- (a) A label glued on the blade with possible blood stains hidden underneath.
- (b) Signatures of various witnesses in ink or pencil on the other side of the blade of the *gandasa* mixed up with suspected blood stains.
- (c) The exhibit is rusty due to its being packed up wet. The rust has mixed with the blood and will therefore interfere with the tests for blood.
- (d) Some suspicious stains have been encircled with ink or pencil marks.

I have here an instrument manufactured by Zeiss called a head magnifier. It magnifies every detail on an exhibit, therefore please do not encircle suspicious stains. The ink or pencil marks often get wet and run into the stains and interfere with the test for blood.

- (6) All exhibits should be serially numbered, that is, from 1 onwards. Do not number 1(a) and 1(b) or

1(1) or 1(2) for different accused. Such numbers are liable to become mixed up.

*Chemical examiner's report.*—(1) Blood can be found and on sending specimens to Calcutta human blood or the blood of some animal can be detected. The origin of the blood could be done in Lahore provided the necessary equipment and staff were forthcoming. However the present procedure works quite satisfactorily.

(2) Blood-grouping in murder cases is not a success in India. The obtaining of sufficient blood in a pure state on exhibits is a difficulty and the taking of blood from the accused for comparison purposes presents further difficulties in India. The test has only a negative value; it cannot help to identify the criminal.

(3) Delivery stains may be differentiated from ordinary blood stains by the presence of foetal hairs, epithelial cells and amniotic fluid. (Explain this.) Menstrual blood may also be detected by the presence of epithelial cells. Generally speaking, the opinion given on the above two points has more of a negative value than a positive value.

(4) Human hairs can be distinguished from animal hairs. Cut hairs can be distinguished from hairs that have been pulled or torn out. Dyed hairs can be differentiated from natural coloured hairs. It is not possible however to give the age or sex of a person from the examination of hairs but foetal hairs can be differentiated from adult hairs.

(5) Bones requiring identification as to origin, age and sex should be sent to the Professor of Anatomy, King Edward Medical College, Lahore. If he cannot identify the bones, then send them to the chemical examiner. If the bones are not burnt, their origin may be determined by the same test as for blood.

(6) Pieces of skin can be identified in my department by the examination of any hairs growing from it. Human hairs only grow from human skin.

(7) Pieces of flesh should be submitted in a salt solution and not in alcohol as alcohol coagulates the albumen. This interferes with the serological test.

## HENRY LESTER INSTITUTE OF MEDICAL RESEARCH, SHANGHAI. ANNUAL REPORT FOR THE YEAR 1936

### INTRODUCTION

THE year 1936 marks the completion of the third full working year of the institute. The reports presented by heads of divisions cover the work of the institute so fully that it seems superfluous to pick out for special comment, in this introductory statement, the achievements of different workers. It will, I think, be admitted, however, by those who are able to assess the value of these reports, that a steady addition to our knowledge is being made in regard to problems mainly of applied research, and that the standard of work has been maintained. Some of the results of these and other researches make us realize that diseases are not specific entities like plants and animals, and that there is a change in the incidence and character of diseases going on, not only in different parts of the world, but also in the same parts of the world at different times. This is so important that I have asked Dr. Maxwell to allow me to publish, as part of this introductory statement, some extracts from the last lecture he gave at the institute. These extracts, of course, express the personal views of the lecturer, but coming as they do from one who has played an important part in the development of modern medicine in China, they should surely challenge our attention.

#### \*Retrospect and prospect\*

'The last forty years have been momentous in the progress of the medical sciences and it is, of course,

\*These abstracts from the lecture of such a well-known figure in Chinese medicine are of such interest to all practitioners in the East that we have taken the liberty of reproducing them in full.

quite impossible to give a complete review. I shall, therefore, confine myself more particularly to personal experiences.

'In my hospital days, three diseases were outstandingly common. Typhoid fever was the curse of the medical wards on account of its prevalence, severity, and the enormous amount of heavy nursing it entailed. So many patients suffering from typhoid came to the hospital that a rule had to be made that no more than five were to be in any one ward at once, owing to the strain it imposed on the nursing staff. Twenty-five years later, one of my daughters nursed for a year in the same hospital, and mostly in the medical wards, without ever seeing a case of typhoid. A few years ago, the secretary of the International Nurses' Council was asked to secure training in typhoid nursing for a group of nurses going out to India, and had to reply that practical training in typhoid nursing was almost impossible to get in England, as only when an occasional small and isolated outbreak occurred were there enough cases in any one place to secure the necessary practical teaching. The disease has disappeared largely as a result of the improvement in public health laws, especially in regard to water and milk.

'On the women's side of our out-patient department, one of the commonest diseases was chlorosis, a form of anaemia that was extraordinarily prevalent among girls working in factories and workshops. As a common disease it has now completely disappeared, and this is undoubtedly due to better conditions in factories, shorter hours, more hygienic clothing, and the attraction of the open air and open-air games.

'The third disease to which I should like to refer is tuberculosis. If not as frequent in England then as it is in China now, it was appallingly common, and took a heavy toll of lives. In the past seventy years, it has decreased by more than 75 per cent and this, again, has been due not so much to treatment, as to health education, and to improved economic conditions.

'Let me now turn to the picture of conditions in the Far East when I first came out thirty-six years ago, and to some of the striking changes which have occurred during these years.

'First, in regard to leprosy. Leprosy treatment was absolutely in its infancy and of knowledge of the causes favouring the development of this disease there was none. Segregation was the only form of treatment suggested and was an obsession of physicians and governments alike, an obsession which unhappily has not even yet disappeared. A few years after my arrival in Formosa, Sir Leonard Rogers developed his treatment with salts of chaulmoogra oil for intravenous injection. Since those days the treatment of leprosy has rapidly advanced, not only through the use of the more modern chaulmoogra preparations, but still more by recognition that concurrent diseases, unhealthy living habits, and probably nutritional defects are most important factors in the development of the disease.

'When I first came abroad, the use of emetine in dysentery was unknown. I well remember the coming of emetine, for I said to myself, if this drug is going to do all that it claims, it ought to be able to do it even though no attempt is made to control the diet. I therefore gave my first injection to a woman in my hospital while leaving her to eat the full hospital diet. The case was happily a very favourable one, and the result in rapid clearing up of the disease was so striking that I have never forgotten it.

'Turning to other subjects, it is a striking thing that the history of helminthology in China has, with one or two exceptions, been covered by my period of time in the East. Hookworm was practically unknown, schistosomiasis had never been heard of, the lung fluke was supposed to be absent, and fasciolopsis confined to the Shaoshing area. It so happened that when I was appointed chairman of the first Research Committee of the China Medical Association in 1907, we took as our main investigation the distribution of the common helminths, and were thus able to establish the prevalence of these parasites.

Cholera killed 6,056 during the year. The *taluks* of Vilavancode, Kalkulam and Agastisvaram were the areas worst affected by this disease. Government note that as a result of the efficient measures adopted the epidemic was soon brought under control. Government hope that with the increased staff and readjustment of the public-health activities in the *taluks* of Thovala, Agastisvaram, Kalkulam, Vilavancode and Shencotta since sanctioned, it would be possible to afford better protection from cholera to the people of these *taluks*.

It is seen that, as in the previous years, the highest number of deaths in the year, 15,706, was caused by different kinds of fevers, including malarial fever. Out of the 216,114 persons treated in hospitals for malaria 106 were reported to have died. But the total state incidence due to malaria is not known. Since malaria is prevalent in epidemic form in certain areas and the affected areas are gradually widening, it will be advantageous if the director of public health will furnish statistics for malaria separate from those for other kinds of fever. Similarly separate statistics may be given for typhoid fever also.

There were 1,910 cases and 652 deaths from smallpox against 2,806 attacks and 1,074 deaths in the previous year. As against 1,393,396 vaccinations performed in 1935 the total number of vaccinations done in 1936 was only 1,076,729 of which 333,905 were primary and 742,824 secondary. It is noted that, although the vaccination campaign has been conducted ever since the middle of 1934, with a staff of nine sanitary inspectors and more than one hundred and twenty vaccinators, excluding the staff working under local governments in municipal areas, only 73.68 per cent of the population have been afforded protection from smallpox at the end of the year. The work should be expedited and completed as early as possible.

The number of vaccinations performed in all the municipalities was 59,264 against 86,270 in 1935. In the Shencotta municipality 60 per cent of the children still remain unprotected and the sanitary inspector under the municipal council, Shencotta, verified only 31.32 per cent of the vaccinations, while the sanitary inspector under the Changanacherry municipal council verified only 18.94 per cent of the vaccinations against the minimum standard of 50 per cent laid down by the Government. This is unsatisfactory. The municipal councils concerned should devote better attention to vaccination work.

The entomological section with its field stations carried on malaria and filariasis surveys and conducted

special investigations into the incidence and types of infection in the areas surveyed. The filariasis control work in Shertalai made good progress. The mosquito-control operations at Alleppey were continued and consequent on the outbreak of plague a rat-flea survey of the town was also undertaken and carried on till the close of the year.

The normal activities of the health unit at Neyyattinkara were considerably affected on account of the pre-occupation of the staff in connection with epidemics. There were 209 cases and 131 deaths from cholera, 68 cases and 30 deaths from smallpox, 72 cases and 21 deaths from typhoid and 105 deaths from malaria within the health unit. The rate of infantile mortality rose from 84.52 to 87.92.

An experimental scheme for the inspection of primary school children in eight *taluks* of the state, with a staff of one sub-assistant surgeon for each *taluk*, was introduced during the year and the work was entrusted to the public-health department. By the end of the year they examined 28,769 pupils attending 200 schools. Defects requiring hospital treatment were discovered in 14,402 pupils of which 10,392 were treated. Three thousand six hundred and fifty-three pupils were found to require specialists' treatment, but only 915 of them received attention. As regards the other suggestions in connection with school medical inspection, such as the provision of midday meals for school children, the alteration of school hours, the provision of pure drinking water and sanitary latrines, the introduction of hygiene as a compulsory subject in schools, etc., the director of public health will address Government separately.

Public-health propaganda was carried on as usual. Lecturing campaigns were undertaken for popularizing smallpox vaccination and for the prevention of the epidemics of cholera and plague. The health educational officer and other officers of the department gave altogether 872 health lectures and talks to an audience of about 169,000 persons. The department also distributed a large number of health bulletins, pamphlets and posters.

Rural sanitation continued to receive the attention of the public-health department. One new minor conservancy station was opened, eighty-four bored-hole latrines were installed and three tube-wells and eight other new public wells were sunk during the year. Improvement, cleaning and repair of 105 public wells and disinfection of 5,187 wells and 37 tanks were also carried out.

## Correspondence

### INTESTINAL DISORDERS IN CHILDREN CAUSED BY SUCKLING IN PREGNANT MOTHER

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—The advantage of breast feeding over that of bottle feeding has been recognized in India for a long time by the laity as well as by the medical profession; but unfortunately there is a common tendency to continue breast feeding for much too long a time and one occasionally encounters a mother suckling an infant well on into the next pregnancy.

In the course of my practice extending over a number of years I have seen six or seven children suffering from severe gastro-intestinal disturbances with vomiting, diarrhoea and fever who failed to respond to ordinary treatment. When it was discovered that the mother was still suckling the child and was herself pregnant again, instruction to cease this practice brought about a rapid cure of the child's illness.

A further point of importance is that, in addition to upsetting the baby, the extra drain on the mother curtailed by providing milk at a time when all her resources

are needed for the nourishment of herself and her unborn child will almost certainly have a harmful effect on her as well as on the foetus.

My object in writing this letter is to draw attention to a condition that is probably not generally recognized in this country and which appears to be fairly common.

Yours, etc.,

S. K. SHUKLA, L.C.P. & S. (Bom.),  
Medical Officer,  
Babra Dispensary.

W. I. S. AGENCY (KATHIAWAR),  
1st October, 1937.

### STUDY OF 110 CASES OF DENGUE FEVER IN THE MADRAS PENITENTIARY

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—It is indeed a pity that out of the my charts of group 'B' none show duration of

for more than 6½ days, whereas the average was 7.17 days.

I have rechecked the charts meant to be despatched to you and to my surprise the three charts selected for despatch were left over here. The duration of fever is 14 days, 9 days and 7 days. This surmounts your first criticism.

All that I have to say in connection with your other criticism is that 'isolated and genuine pieces' when put together are likely at some future date to present a picture which may be a better representation of a panorama than the one already existing. That swatting measures against the culex brought the epidemic to a speedy termination is another fact which I have not clearly stressed in my paper.

Yours, etc.,

P. V. KARAMCHANDANI, M.B.,  
F.R.C.P. (Edin.),  
MAJOR, I.M.S.

*Superintendent, Central Jail.*

CANNANORE,

25th October, 1937.

[Note.—We agree with our correspondent; medicine is a progressive science and we should always be ready to revise our ideas when facts contradict them.

If the last statement in the above letter could be proved, then the case for the culex transmission of dengue would be strengthened, but does not our correspondent possibly mean 'the dengue epidemic rapidly came to an end after swatting measures had been instituted'—in their significance the two statements are oceans apart.—EDITOR, I. M. G.]

## FURTHER RESEARCH ON EPIDEMIC DROPSY

*To the Editor, THE INDIAN MEDICAL GAZETTE*

SIR,—I have read with considerable interest your leading article on epidemic dropsy in the October issue of the *Gazette*. I wish to draw your attention to one or two points in connection with your reference to our work on the subject. While offering criticism on the deductions made by us from our experiments you make no mention of the fact that albumin was not detected in the samples of urine in which hyaline and finely granular casts were found. Besides I fail to see how the presence of these casts in the urine of experimental cases invalidate the conclusions arrived at.

In fairness to the rice theory, I might mention that we have made no categorical statement to the effect that epidemic dropsy has been observed in persons who have not used rice at all. The fact is that we came across only two patients who stated that for certain reasons they had given up the use of rice as a regular article of food and it was only on very special occasions that they took any rice.

Whether the mustard-oil theory, which is at present, admittedly incomplete, is accepted as proven or not, there is no gainsaying the fact that the recent work has narrowed down the issues and therefore the theory deserves to be fully worked out. Under the circumstances I venture to say that the pessimism manifest in the concluding paragraphs of your article and the recommendations to revive an old theory on merely speculative grounds appear to be hardly justified.

Yours, etc.,

R. B. LAL,

*Officiating Director.*

ALL-INDIA INSTITUTE OF  
HYGIENE AND PUBLIC HEALTH,  
CALCUTTA,

8th November, 1937.

## Service Notes

### APPOINTMENTS AND TRANSFERS

ON return from leave Colonel C. H. Reinhold, M.C., Inspector-General of Civil Hospitals, Punjab, resumed charge of his duties on the 4th September, 1937.

Lieutenant-Colonel G. Covell is placed on foreign service under the Indian Research Fund Association for appointment as Director, Malaria Survey of India.

ON return from leave Lieutenant-Colonel Jamal-ud-Din, Civil Surgeon, Lyallpur, resumed charge of his duties on the 13th September, 1937.

Lieutenant-Colonel J. J. Rooney resumed charge of his appointment of Residency Surgeon, Bushire, from 27th September, 1937.

Lieutenant-Colonel R. C. Clifford, M.C., D.S.O., appointed as Civil Surgeon, New Delhi, from 20th October, 1937.

The services of Lieutenant-Colonel B. Gale are replaced at the disposal of the Government of the Punjab. Dated 27th October, 1937.

Lieutenant-Colonel A. S. Fry is appointed as Civil Surgeon, Simla East.

Lieutenant-Colonel B. H. Singh, on the expiry of his leave, will be posted to Mynensingh as Civil Surgeon, *vice* Lieutenant-Colonel S. Nag, granted leave.

Lieutenant-Colonel P. Banerji, on the expiry of his leave, is appointed as Civil Surgeon, Burdwan, *vice* Lieutenant-Colonel B. H. Singh.

The undermentioned officers are transferred on probation to the Civil Branch of the Indian Medical Service:—

Captain A. A. Pullar, Bombay. Dated 7th July, 1937.  
Captain J. Edis Myers, Madras. Dated 1st July, 1937.

Captain C. E. Millar, Bombay. Dated 6th August, 1937.

Captain A. C. Taylor, Bihar. Dated 8th July, 1937.

### *To be Captain*

J. H. Caverhill from R. A. M. C., 27th June, 1937, with seniority as Lieutenant, 28th August, 1935, and as Captain, 28th August, 1936.

ON return from leave Captain J. P. J. Little, Civil Surgeon, Dera Ghazi Khan, resumed charge of his duties on the 1st September, 1937.

Captain F. H. A. L. Davidson made over charge of the Midnapore Central Jail to Captain F. W. Allinson, on the forenoon of the 30th September, 1937.

The undermentioned officers are restored to the establishment and their seniority is antedated to the 31st August, 1936.

31st August, 1937.

Lieutenant J. W. R. Sarkies.

Lieutenant F. MacD. Byrn.

### *To be Lieutenants (on probation)*

31st August, 1937.

John Laing Mewton, with seniority 29th February, 1936.

Alan Francis Goode, with seniority 29th February, 1936.

Lambert Ulrich Kamm, with seniority 31st August, 1936.

Thomas Denness, with seniority 31st August, 1936.

Alan Campbell Glendinning (secd.).

George Boyce Jackson (secd.).

Joseph Henry Briscoe-Smith (secd.).

Edward Lewis Wilson (secd.).

### LEAVE

Lieutenant-Colonel S. Nag, Civil Surgeon, Mymensingh, is granted leave on average pay for 8 months, provided the leave is spent elsewhere than in India, Ceylon, Nepal or Burma, leave on half average pay for



6 months and eighteen days, and study leave for 4 months, with effect from the date on which he is relieved.

Major G. J. Joyce, Civil Surgeon, Murree, is granted leave on average pay for 6 months, with effect from the 21st September, 1937.

Captain G. B. W. Fisher, 1st Resident Medical Officer of the Presidency General Hospital, Calcutta, is granted leave for 18 months, namely, leave on average pay for 8 months, study leave for 8 months and 26 days, and leave on half average pay for the remaining period, respectively, with effect from the 19th October, 1937, or from any subsequent date on which the leave is availed of.

#### PROMOTIONS

##### *Lieutenant-Colonels to be Colonels*

J. A. S. Phillips, C.I.E (with seniority from 2nd August, 1930). Dated 28th January, 1937.

D. H. Rai, M.C. (with seniority from 27th January, 1931). Dated 1st March, 1937.

R. S. Townsend, M.C. (with seniority from 1st August, 1931). Dated 16th September, 1937.

##### *Major to be Lieutenant-Colonel*

A. S. Garewal. Dated 1st October, 1937.

#### RELINQUISHMENTS

Captain C. K. Byrnes relinquishes his probationary appointment. Dated 4th August, 1937.

Lieutenant A. A. Khan relinquishes his temporary commission. Dated 5th September, 1937.

#### RETIREMENTS

Major-General Sir F. P. Connor, Kt., D.S.O., K.H.S. Dated 16th September, 1937.

Lieutenant-Colonel R. de S. B. Herrick, D.S.O. Dated 2nd October, 1937.

## Notes

### TONSILLITIS. PHARYNGITIS. LARYNGITIS.

With the onset of the colder weather the incidence of 'throat conditions' usually begins to take an upward curve.

In such diseases physicians who use antiphlogistine as a routine application find that it constitutes one of the best methods of treatment at their disposal, and an ideal adjuvant to other general measures.

The heat which antiphlogistine imparts not only is very soothing, but the medication of the dressing itself is also of much benefit in reducing the inflammation and effecting resolution.

When applying antiphlogistine it is, of course, very important that the correct technique be followed. If it is applied comfortably hot, to the thickness of  $\frac{1}{4}$  to  $\frac{1}{2}$  inch (it should never be spread as an ointment), then covered with cotton and bandaged, full therapeutic effect will be had from the medication.

### GLUCO-FEDRIN

GLUCO-FEDRIN, a new glucose ephedrine inhalant manufactured by Parke, Davis and Company, is an isotonic aqueous-dextrose solution containing menthol, chlorotone and ephedrine, its blandness, ready miscibility with nasal secretions, and stability make it a particularly satisfactory inhalant.

It is a departure from the usual type of inhalant for, instead of oil as the vehicle, an isotonic aqueous-glucose

solution which is miscible with nasal secretions. Aqueous solutions of ephedrine are considered to be more effective solutions but the lack of adhesive properties is a disadvantage; however Gluco-Fedrin is adhesive to remain in contact with the nasal membrane when applied with either a nebulizer.

Gluco-Fedrin is ideal for routine use as a constrictor in diagnostic investigation of the accessory sinuses. It is especially useful for acutely inflamed nasal mucous membranes and sinus drainage.

It is rapidly effective—satisfactory shrinkage of membranes is ordinarily obtained within minutes; the effect persisting for several hours.

For the relief of hay fever and other rhinitis Gluco-Fedrin will be found to give improvement over most preparations for this purpose.

Its effectiveness as an astringent does not further irritate acutely inflamed membranes, which are much appreciated by the patient.

Gluco-Fedrin is supplied in a glass dropper and may be applied by the patient with a Parke, Davis Glasepti.

Further information on this preparation may be obtained from Messrs. Parke, Davis and Company, Bombay.

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